Revista Brasileira de Ornitologia 15 (2) 151-174
junho de 2007

Diamantina Tapaculo, a new *Scytalopus* endemic to the Chapada Diamantina, northeastern Brazil (Passeriformes: Rhinocryptidae)

Marcos Ricardo Bornschein[1], Giovanni Nachtigall Maurício[2,3], Ricardo Belmonte-Lopes[4], Helena Mata[2,5] , and Sandro L. Bonatto[5]

[1] Comitê Brasileiro de Registros Ornitológicos and Liga Ambiental. R. Olga de Araújo Espíndola, 1380, conj. res. Paiquerê II, bl. N, ap. 31, 81050-280, Curitiba, PR, Brazil. E-mail: mbr@bbs2.sul.com.br

[2] Programa de Pós-graduação em Biociências – Zoologia. Laboratório de Ornitologia, Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul. Av. Ipiranga, 6681, CEP 90619-900, Porto Alegre, RS, Brazil.

[3] Grupo Especial de Estudo e Proteção do Ambiente Aquático do Rio Grande do Sul – GEEPAA-RS, Rua Tiradentes, 2247, CEP 96010-160, Pelotas, RS, Brazil. E-mail: gnachtigallmauricio@yahoo.com.br

[4] Mater Natura Instituto de Estudos Ambientais. Av. Senador Souza Naves, 701, ap. 191, 80050-040, Curitiba, PR, Brazil. E-mail: rbelmonte_lopes@yahoo.com.br

[5] Centro de Biologia Genômica e Molecular, Faculdade de Biociências, Pontifícia Universidade Católica do Rio Grande do Sul. Av. Ipiranga, 6681, CEP 90619-900, Porto Alegre, RS, Brazil

Recebido em 12 de maio de 2007; aceito em 10 de agosto de 2007

RESUMO. **Tapaculo-da-chapada-diamantina, um novo *Scytalopus* endêmico da Chapada Diamantina, nordeste do Brasil (Passeriformes: Rhinocryptidae)**. As populações de *Scytalopus* que ocupam a Chapada Diamantina (Bahia) têm sido consideradas como pertencentes ao mesmo táxon encontrado na porção meridional da Serra do Espinhaço (Minas Gerais). Entretanto, com base em material recentemente obtido na Chapada Diamantina, descobrimos que a população local de *Scytalopus* é nova, distinta de qualquer outra conhecida. A nova espécie é um membro do taxonomicamente complexo grupo *S. speluncae*, dentro do qual é mais proximamente relacionada com *S. novacapitalis*, *S. pachecoi* e *Scytalopus* sp. nov., do sul da Serra do Espinhaço. É diagnosticável por caracteres vocais, de plumagem e genéticos de todos os outros táxons brasileiros do gênero. Embora o seu canto apresente poucas diferenças em relação ao canto das espécies mais aparentadas, suas chamadas são notavelmente distintas. A divergência genética entre a nova espécie e *S. novacapitalis*, *Scytalopus* sp. nov. e *S. pachecoi* é de 3.5, 4.5 e 5.0%, respectivamente. A nova espécie é presumivelmente endêmica da Chapada Diamantina, onde habita floresta (c. 10-25 m de altura) e capoeiras (c. 2-5 m de altura), em altitudes entre 850 e 1600 m s.n.m.

Palavras-chave: *Scytalopus*, espécie nova, vocalização, ND2, Serra do Espinhaço, Chapada Diamantina, Brasil.

ABSTRACT. The *Scytalopus* populations occupying the Chapada Diamantina, state of Bahia, have been regarded as representing the same taxon found in the southern part of Serra do Espinhaço, in the state of Minas Gerais. However, on the basis of specimens obtained recently at Chapada Diamantina, we found that the local *Scytalopus* population is a new taxon distinct from any other known tapaculo. The new species is a member of the taxonomically complex *S. speluncae* group, within which it is most closely related to *S. novacapitalis*, *S. pachecoi*, and *Scytalopus* sp. nov. from southern Serra do Espinhaço. It is diagnosable by vocal, plumage and molecular characters from all other Brazilian taxa. Although its song differs little from those of the closely related species, its calls are notably distinct. Pairwise uncorrected genetic distances between the new species described herein and *S. novacapitalis*, *Scytalopus* sp. nov. and *S. pachecoi* are 3.5, 4.5 and 5.0%, respectively. The new species is presumably endemic to the Chapada Diamantina, where it inhabits forest (c. 10-25 m tall) and both old and very young second growth (c. 2-5 m tall), between 850 and 1,600 m a.s.l.

Key words: *Scytalopus*, new species, vocalization, ND2, Serra do Espinhaço, Chapada Diamantina, Brazil.

The Brazilian *Scytalopus* have been clustered into two discrete complexes, namely the *S. indigoticus* and *S. speluncae* species groups, comprising two and four named taxa, respectively (Maurício 2005). The former complex, however, actually comprises a distinct genus (manuscript in prep.), while the latter is composed by typical representatives of *Scytalopus*. Of the latter group, two species historically or recently misidentified as *S. speluncae* (Mouse-colored Tapaculo) were described in the last few years: *S. iraiensis* (Bornschein *et al*. 1998) and *S. pachecoi* (Maurício 2005), both from southern Brazil (the second also from adjacent Misiones Province, Argentina). *Scytalopus notorius*, a name recently proposed by Raposo *et al*. (2006) for the dark gray birds of the coastal ranges of eastern Brazil (Mantiqueira and Serra do Mar), was based on the supposed historical misapplication of the name *S. speluncae* to those birds. Those authors argued that this name must be used only for a light gray form known from the Serra do Espinhaço in the states of Minas Gerais and Bahia. Surprisingly however, this assumption did not find support in the analysis of the type specimen of *S. speluncae* presented by the authors, and we argue for the continued application of this name to the dark gray forms occupying the coastal

ranges (manuscript in prep.). All populations identified to date as Mouse-colored Tapaculos are under revision and will eventually be split into new species (manuscript in prep.; see Maurício 2005).

As a result of the studies we have conducted over the last few years on the taxonomy and phylogeny of the Brazilian *Scytalopus*, it became clear that the understanding of species limits and evolutionary relationships among them is still very incomplete (see Bornschein *et al.* 1998, Maurício 2005). Although the *Scytalopus* population occupying the Chapada Diamantina – the northern part of Serra do Espinhaço, in the state of Bahia – was judged to represent the same taxon found in the southern section of this massif, in the state of Minas Gerais (Maurício 2005; Raposo *et al.* 2006), it has been postulated that they might represent more than one species (Bencke and Maurício 2006). Our studies revealed that the *Scytalopus* population from the Chapada Diamantina represents a new taxon distinct from any other member of the genus, including those populations from Serra do Espinhaço in Minas Gerais state; therefore this new taxon is described herein.

METHODS

Between 19 and 26 August 2006 we conducted field work in the Chapada Diamantina area, Bahia, Brazil, to study the local *Scytalopus* population. We spent six days collecting specimens and tape-recording vocalizations of the new species. In an effort to gather adequate material for comparative purposes, we have studied all other Brazilian *Scytalopus* species in the field during the last four years in the following Brazilian states: Distrito Federal, Bahia, Minas Gerais, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul. We spent several days afield in 2003-2004 studying the closely related taxa *Scytalopus* sp. nov. (a second unnamed taxon from the Serra do Espinhaço and nearby ranges; 12 days of sampling) and *S. novacapitalis* (3 days of sampling). Specimens were collected with mist-nets and shotguns and were housed at the ornithological collections of Museu de Ciências e Tecnologia of the Pontifícia Universidade Católica do Rio Grande do Sul (MCP), Porto Alegre, and Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo. Tissue samples were taken from recently collected specimens and were deposited at the Laboratório de Ornitologia of MCP. Vocalizations were recorded with Sony TCM 5000EV tape-recorders and Sennheiser ME 66 and ME 67 microphones. Tape-recordings will be deposited at the Arquivo Sonoro Prof. Elias Coelho (ASEC), Universidade Federal do Rio de Janeiro.

In recently collected specimens, we took body mass (using a 30 g Pesola scale), counted wing and tail feathers (following Bornschein *et al.* 1998), observed the general condition of pterylosis (*cf.* Bornschein *et al.* 1998), and described soft-part colors. Capitalized color names follow Smithe (1975). We examined skeletons to determine the condition of the sternum (following Heimerdinger and Ames 1967). Syringeal specimens were described according to the terminology of Ames (1971), and were dissected from only one side of each specimen (following Bornschein *et al.* 1995, 1998). All syringes were fixed in formalin 10% for several days before the staining process, which comprised the following steps: 1) immersion in Alizarin Red S for 24-72 h (for calcium staining; Springer and Johnson 2000); 2) immersion in Alcian Blue for 24-96 h (for cartilage staining; Wassersug 1976); and 3) Iodine for short periods of immersion (for muscle staining; Cannell 1988). The stained material was stored in ethanol at 70%.

Tape-recordings were digitized at 44.1 kHz, 16-bit, and were analyzed using the program Cool Edit 96 (Syntrillium Software Corporation). Spectrograms were produced in a personal computer using Raven 1.2.1 for Windows at the Laboratório de Herpetologia of the Instituto de Biologia of the Universidade Estadual Paulista (Rio Claro, state of São Paulo), in Blackman window type, with a resolution of 512 bands and overlap of 99%. Vocal variables analyzed from tape-recordings were pace, total duration and, for the individual notes, frequency, length, shape and structure. Note parameters were taken from the fundamental. Pace is defined as the number of notes delivered per second, and was calculated by dividing the number of counted notes by the time interval comprised between the beginning of the first counted note and the beginning of the last note.

Short sequences of the song, e.g. those with less than 40 notes, were discarded for song analyses, as presented below (see "*Vocalizations*"). These short songs were recorded from very excited birds responding to successive playbacks; sometimes these aberrant songs were delivered between longer song sequences or as a sequence of very short songs. Additionally, these short song sequences present a highly variable pace that seems to vary according to the degree of excitement of the birds. Songs presenting variations in the first notes ("warming" notes, which are delivered at shorter intervals and are lower pitched, being not comparable to the remaining song notes) had these notes analyzed separately and discarded for pace calculation and for other descriptive song parameters (e.g. frequency, length and shape of notes). Songs which showed distinct change in pace (accelerating songs) were divided into the following three sections for calculations of pace: the initial section, the trilled final section and the transition between those two sections (i.e. when the inter-note intervals became increasingly shorter before stabilizing in the accelerated end). Frequency measures were taken through visual inspection of the spectrograms. Measures of frequency and note length of non-accelerating songs were taken from 15 notes in the middle section of each song. In accelerating songs, these measures were taken from five notes from each of the three sections defined for pace measurements. For multi-noted calls (e.g., alarm calls), frequency and note length were taken from one note in the middle of calls, and for shorter calls all notes were measured. When more than one recording was available for a given individual, a mean of its sample was calculated

first; then, the mean value obtained for each bird was the basis for the general mean and standard deviation calculations of each species. This approach avoids overestimation of intraindividual variations (i.e. pseudoreplication) over intraspecific (between different birds of the same species) variation. Most recordings were obtained after playback. Poor-quality recordings, as seen in the spectrograms, were excluded from the analyses.

Specimens were examined at Coleção Ornitológica Marcelo Bagno (COMB) of the Universidade de Brasília, Brasília, Distrito Federal, Museu Nacional (MN), Rio de Janeiro, state of Rio de Janeiro, Museu de História Natural de Taubaté (MHNT), Taubaté, state of São Paulo, Museu de História Natural "Capão da Imbuia" (MHNCI), Curitiba, state of Paraná, Museu de Ciências Naturais of Fundação Zoobotânica do Rio Grande do Sul (MCN/FZB), Porto Alegre, state of Rio Grande do Sul, as well at MZUSP and MCP (see above). The following measurements were taken from specimens with calipers to the nearest 0.1 mm: bill length (from distal edge of the operculum to the bill tip), length of the exposed culmen, bill depth (taken at the line of the proximal edge of the nares), wing length (chord), tail length (from the insertion of the central rectrices to their tip), and tarsus length. Body masses were taken from specimen's labels. Measures of unsexed specimens were excluded from the analysis. We also excluded measurements of worn feathers, and did not take tail measurements when both central rectrices were lacking. Specimens and tape-recordings examined are listed in the appendix.

RESULTS

Scytalopus diamantinensis sp. nov.
Diamantina Tapaculo
Tapaculo-da-chapada-diamantina (Portuguese name)

Holotype. MCP 1896, immature male (see "*Age and reproductive conditions*" below), Capão do Vale (13°26'24"S, 41°23'54"W; c. 1.200 m a.s.l.), municipality of Ibicoara, state of Bahia, Brazil. Collected and tape recorded by M.R.B., G.N.M., R.B.-L. and L. C. C. Robert on 21 August 2006 and prepared as a study skin by M.R.B. Tissue samples deposited at MCP. DNA sequence of 615 base pairs from the second subunit of the NADH dehydrogenase gene (ND2) deposited in GenBank (accession number EF608554). Tape-recordings of vocalizations to be archived at ASEC (vocal samples listed in the appendix).
Paratypes. MCP 1900 (cover plate, Figures 1 and 2), adult

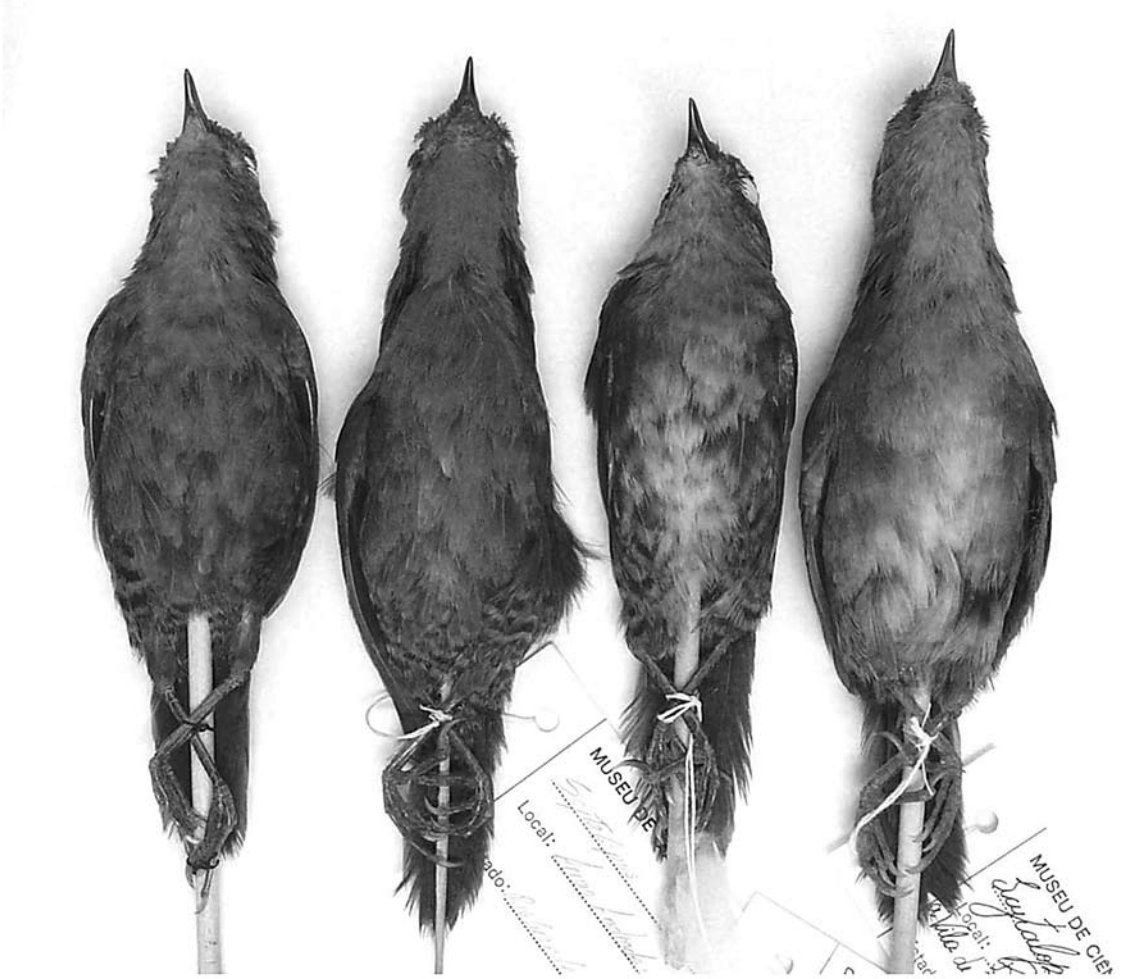

Figure 1. Adult males of four closely related *Scytalopus* taxa (from left to right): *S. diamantinensis* (MCP 1900, paratype), *S. pachecoi* (MCP 962, paratype), *Scytalopus* sp. nov. (MCP 1510), and *S. novacapitalis* (MCP 1481).

Figure 2. Left: Adult male of Diamantina Tapaculo *Scytalopus diamantinensis* (MCP 1900, paratype). Right: typical habitat of *S. diamantinensis* at Morros de Ouro, municipality of Barra da Estiva, state of Bahia.

male, Campo Redondo (13°24'09"S, 41°14'09"W; c. 1.050 m a. s. l.), within the Serra do Sincorá, municipality of Ibicoara, Bahia, 21 August 2006. MCP 1898, adult male, Serra do Ribeirão (12°34'S, 41°25'W; c. 850 m a.s.l.), municipality of Lençóis, Bahia, 23 August 2006; DNA sequence of 535 bp from the second subunit of the NADH dehydrogenase gene (ND2) deposited in GenBank (accession number EF608553). MZUSP 77827, subadult male, same locality and date as MCP 1898. MCP 1897, subadult female, same locality and date as MCP 1898. Collectors and the preparator of paratypes were the same as the holotype. Tissue samples of all paratypes deposited at MCP. Tape-recordings of vocalizations of all paratypes will be archived at ASEC (vocal samples listed in the appendix).

Diagnosis. By presenting Pteryla ventralis (the pterylosis of the ventral tract) undivided in the flank margin; mobile nasal operculum; tracheal syrinx with Membranae tracheales, Processus vocalis, and absence of intrinsic muscles; four-notched sternum; small size (total length c. 130 mm; body mass c. 16 g); predominantly gray coloration; relatively short tail (much shorter than wing); and a comparatively less elevated base of the bill, the new species matches the current definition of the genus *Scytalopus* (see Krabbe and Schulenberg 1997, 2003, Bornschein *et al.* 1998). *Scytalopus diamantinensis* is a member of the *S. speluncae* group, whose taxa are characterized by having a predominantly gray plumage – with the underparts varying from light-gray/whitish to blackish-gray – and a song composed by the long (frequently more than a minute) repetition of the same simple note (Bornschein *et al.* 1998, Maurício 2005).

Immature males of *S. diamantinensis* are distinguishable from those of *S. pachecoi* by the barring pattern on the upper wing coverts. In *S. diamantinensis* (n = 2) the greater wing coverts have one or two black blotches on the brown outer web followed, over both webs, by a wide black bar, a narrower brown (or Cinnamon) bar and a terminal black band, while in *S. pachecoi* (n = 4) the coverts are mostly gray, being marked – only on the outer web – by a small brown area and a black and a Cinnamon spot (Figure 3). In adult male (n = 3 for *S. diamantinensis*, and n = 11 for *S. pachecoi*; Figure 1) and female plumages (*S. diamantinensis* n = 2, *S. pachecoi* n = 1), *S. diamantinensis* and *S. pachecoi* are undistinguishable. Males of the new species are, on average, larger than those of *S. pachecoi* in all measurements, with no overlap in range only in bill depth and culmen length (Table 1); females of the new species are larger (no range overlap) than those of *S. pachecoi* in all measurements, except for tail (Table 1). Adult males of *S. diamantinensis* are diagnosable from males of *Scytalopus* sp. nov. by the lack of a whitish (n = 4) or pale-gray (n = 1) area over the belly (Figure 1). From both sexes of *S. novacapitalis* (n = 2 males, n = 1 female) the new species (both sexes) differs by the lack of whitish on the belly and by having the underparts Medium Neutral Gray (near 84) or slightly paler instead of Pale Neutral Gray (86) (Figure 1). From both sexes of *S. iraiensis* (n = 7) the new tapaculo can be reliably distinguished by its flanks being light brown barred with blackish instead of Dark Neutral Gray (near 83) with no or faint irregular bars and by its lighter upperparts. Adult males of *S. diamantinensis* differed immediately from birds judged to be adult males of *S. speluncae* (n = 24) by having barred flanks, vs. flank feathers uniformly gray or with only vestigial barring and by having lighter gray underparts.

Scytalopus diamantinensis utters a distinct short call that has not been recorded in any other taxa belonging to the *S. speluncae* group; this unique call consists of a single "tcheep" note spectrographically similar to, but typically higher-pitched than, the song note (Figure 4a, b). This call is a very common element of the species' vocal repertory, being delivered alone randomly or regularly by (apparently) paired birds. There is another equally diagnostic, similar call, consisting of a "tcheep" note followed by a sharper, lower-pitched and shorter note (Figure 4c, d). The new species' alarm call differs in pace (with some overlap in range with *Scytalopus* sp. nov. and *S. pachecoi*) and note shape from all other members of the group, except *S. novacapitalis* (Figure 5, Table 2). The song of *S. diamantinensis* is very similar to those of *Scytalopus* sp. nov. and *S. pachecoi*, but is generally faster-paced (with some overlap) and lower-pitched (overlapping widely

Table 1. Measurements (mm) of taxa in the *Scytalopus speluncae* group. The values shown are range, sample size (in parentheses), and mean ± standard deviation. Abbreviations: "m" = male and "f" = female. *Scytalopus speluncae* is divided into southern and northern populations according to Maurício (2005).

Species / Characters	Sex	*S. diamantinensis*	*Scytalopus* sp. nov.	*S. pachecoi*	*S. novacapitalis*	southern *S. speluncae*	northern *S. speluncae*	*S. iraiensis*
Bill	m	6.0-6.7 (6)	6.0-6.6 (5)	5.0-6.0 (23)	6.4 (1)	5.1-5.8 (17)	5.1-6.5 (16)	5.1-5.7 (4)
		6.4 ± 0.3	6.3 ± 0.22	5.5 ± 0.27		5.4 ± 0.21	5.4 ± 0.38	5.4 ± 0.25
	f	5.8, 6.0 (2)		5.0, 5.6 (2)	6.0 (1)	4.8-5.5 (4)	4.8-5.8 (10)	5.0, 5.2 (2)
						5.2 ± 0.34	5.3 ± 0.34	
Bill depth	m	4.3-4.8 (6)	4.3-4.4 (5)	3.6-4.2 (22)	4.3, 4.7 (2)	3.5-4.1 (13)	3.3-4.7 (15)	4.0-4.4 (3)
		4.6 ± 0.17	4.3 ± 0.05	3.9 ± 0.19		3.8 ± 0.21	3.8 ± 0.3	4.3 ± 0.23
	f	4.2, 4.3 (2)		3.2, 3.8 (2)	4.3 (1)	3.4-3.7 (3)	3.5-4.0 (7)	4.2 (1)
						3.6 ± 0.15	3.7 ± 0.17	
Culmen	m	11.7-12.6 (6)	11.2-12.5 (5)	10.1-11.5 (23)	12.0 (1)	10.0-11.8 (17)	10.8-12.0 (16)	11.2-11.7 (3)
		12.3 ± 0.37	11.9 ± 0.45	10.9 ± 0.38		10.9 ± 0.4	11.2 ± 0.5	11.5 ± 0.25
	f	11.3, 11.6 (2)		10.3, 10.7 (2)	11.6 (1)	10.4-11.3 (4)	10.1-12.0 (9)	10.6 (1)
						10.8 ± 0.39	10.9 ± 0.64	
Wing (chord)	m	50.5-56.0 (6)	48.9-52.4 (5)	46.0-51.6 (23)	50.1, 53.8 (2)	43.6-50.7 (17)	48.0-53.5 (17)	44.5-49.4 (5)
		53.2 ± 2.08	51.1 ± 1.43	49.4 ± 1.36		46.8 ± 2.0	50.0 ± 2.15	47.0 ± 2.01
	f	49.7-51.0 (3)		45.2, 48.4 (2)	51.7 (1)	43.3-49.0 (4)	44.8-49.5 (10)	43.3, 45.6 (2)
		50.2 ± 0.55				45.9 ± 2.34	47.7 ± 1.35	
Tail	m	42.0-50.0 (5)	42.0-49.7 (4)	38.0-44.8 (21)	45.0, 48.2 (2)	36.6-44.1 (14)	43.5-48.8 (16)	38.4-41.0 (4)
		44.9 ± 3.07	45.1 ± 3.44	41.7 ± 2.07		39.9 ± 1.98	45.9 ± 2.8	39.6 ± 1.32
	f	39.0-43.6 (3)		42.8 (1)	45.2 (1)	36.2-39.2 (3)	38.3-44.4 (10)	37.7, 38.2 (2)
		41.7 ± 1.97				37.5 ± 1.54	41.5 ± 1.83	
Tarsus	m	19.5-21.1 (6)	19.5-21.1 (5)	18.3-20.1 (23)	19.9, 20.4 (2)	18.0-19.8 (16)	19.1-21.3 (17)	17.7-19.6 (5)
		20.3 ± 0.65	20.2 ± 0.66	19.1 ± 0.46		18.8 ± 0.46	20.2 ± 0.72	18.7 ± 0.86
	f	19.9-20.5 (3)		17.9, 18.1 (2)	19.2 (1)	17.2-20.2 (4)	18.5-20.6 (10)	18.3, 18.5 (2)
		20.3 ± 0,35				18.8 ± 1.42	19.5 ± 0.6	
Weight (g)	m	16.0-17.2 (4)	16.4-18.3 (3)	13.2-17.0 (23)	19.2 (2)	11.2-14.9 (13)	13.3-16.0 (6)	12.8-15.0 (5)
		16.4 ± 0.49	17.2 ± 0.96	15.1 ± 0.99		12.9 ± 1.1	14.9 ± 0.8	14.0 ± 1.04
	f	15.3 (1)		13.0, 13.6 (2)	18.6	12.3-15.0 (3)	14.1-15.8 (4)	12.4, 12.4 (2)
						13.8 ± 1.36	14.8 ± 0.73	

Figure 3. Color patterns of the upper wing coverts of immatures of (from left to right) *Scytalopus diamantinensis* (MCP 1896, holotype), *S. pachecoi* (MCP 1082, paratype) and *Scytalopus* sp. nov. (MCP 1509).

in frequency range with *Scytalopus* sp. nov. and only slightly with *S. pachecoi*). In comparison with *S. novacapitalis* it differs consistently (i.e. no overlap in range) in pace (faster in the new species) and note length (longer in *S. novacapitalis*) (Figure 6, Table 2). Some parameters of the accelerating song differed between *S. diamantinensis* and its three most closely related species (*S. novacapitalis*, *S. pachecoi*, and *Scytalopus* sp. nov.; see "*Systematic relationships*" below): pace of the initial section (slower in the other taxa, with some overlap with *S. pachecoi*), pace of the transition (faster in *Scytalopus* sp. nov. and *S. pachecoi*), duration of the transition (shorter in *Scytalopus* sp. nov.), frequency of the trilled section (the notes of this section are higher-pitched in *S. pachecoi*, with a slight overlap in range) and length of notes in the trilled section (the notes are longer in *Scytalopus* sp. nov.) (Figure 7, Table 2). From the more distantly related *S. speluncae* and *S. iraiensis*, the new species further differs by its slower song pace (there is some overlap with *S. iraiensis*) and shape of song notes (Table 2, see also spectrograms in Bornschein *et al.* 1998 and Maurício 2005).

Scytalopus diamantinensis is also diagnosed on the basis of mitochondrial DNA sequences from all other members of the *S. speluncae* group (see "*Systematic relationships*" below).

Description of holotype. Crown, nape, dorsal surface of neck and back Blackish Neutral Gray (82) washed Dark Brownish Olive (near 129), more intensely on the hind neck. Forehead feathers Medium Neutral Gray (near 84) tipped Dark Neutral Gray (83). Rump Dark Brownish Olive barred blackish, with one or two Cinnamon (near 123A) bars posteriorly. Upper tail coverts barred black and Mars Brown (near 223A) posterioly and Dark Brownish Olive and black anteriorly. The scapulars are Blackish Neutral Gray with brownish areas. Some of them

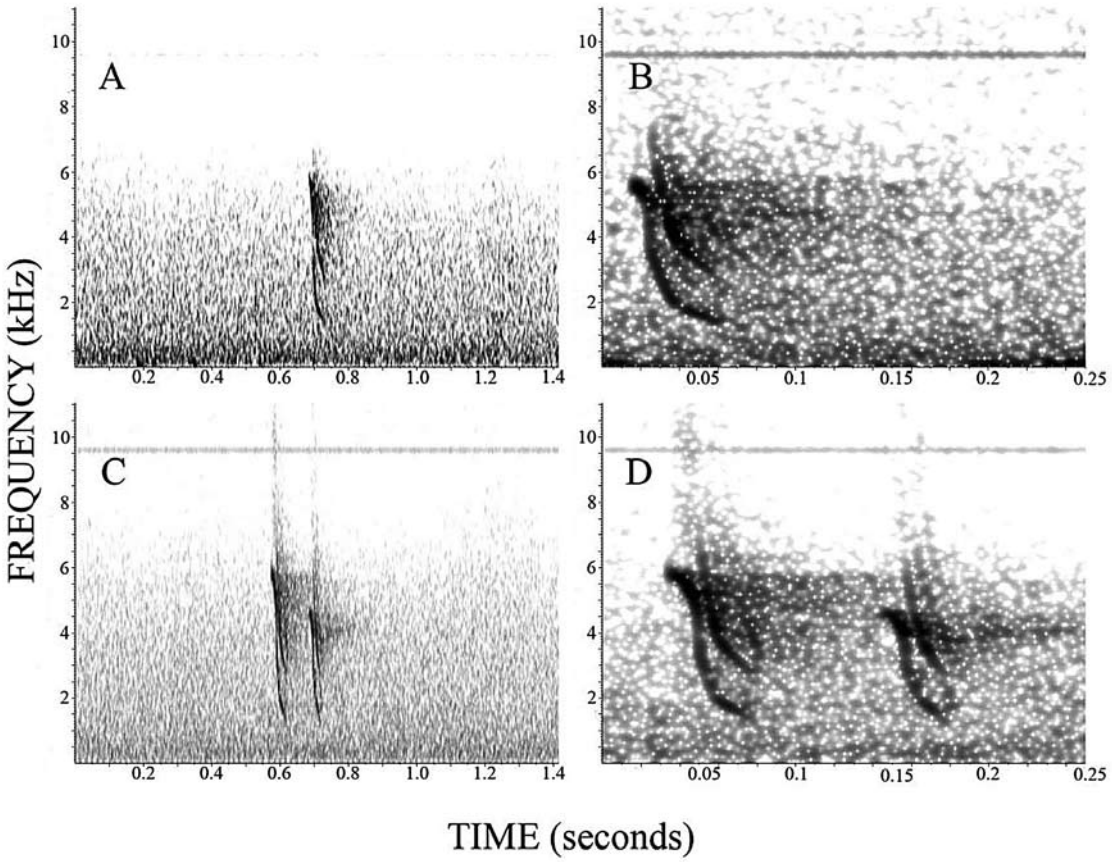

Figure 4. Spectrograms of two types of calls of *Scytalopus diamantinensis*. **A.** Monosyllabic call, Morros de Ouro, municipality of Barra da Estiva, state of Bahia, 26 August 2006 (recorded by R.B.-L.). **B.** Same note as in A in detail. **C.** Bissyllabic call, Morros de Ouro, municipality of Barra da Estiva, state of Bahia, 26 August 2006 (recorded by R.B.-L.). **D.** Same call as in C in detail.

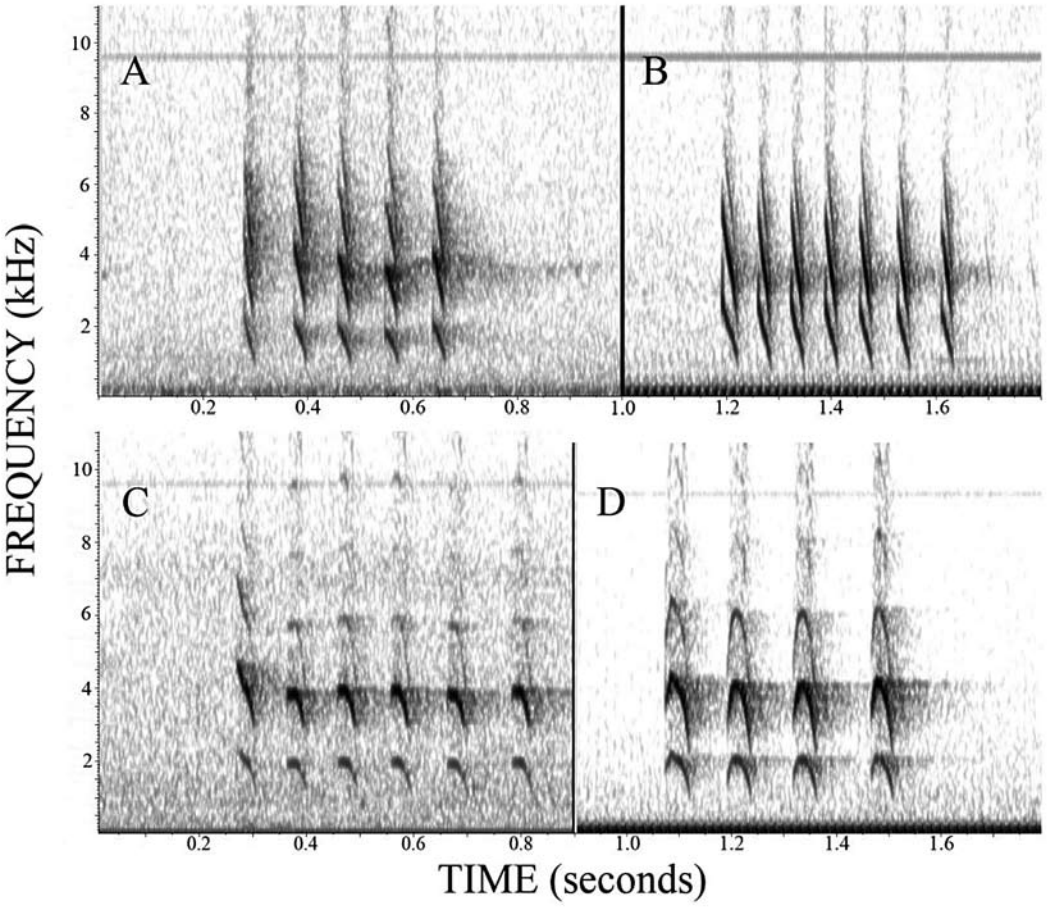

Figure 5. Spectrograms of alarm calls of four species of *Scytalopus*. **A.** *S. diamantinensis*, Morros de Ouro, municipality of Barra da Estiva, state of Bahia, 26 August 2006 (recorded by G.N.M.). **B.** *S. novacapitalis*, Reserva Ecológica do IBGE, Brasília, Distrito Federal, 24 September 1981 (recorded by J. Vielliard). **C.** *Scytalopus* sp. nov., Pico do Itambé, Pico do Itambé State Park, municipality of Santo Antônio do Itambé, state of Minas Gerais, 17 January 2004 (recorded by M.R.B.). **D.** *S. pachecoi*, Serra das Asperezas, municipality of Piratini, state of Rio Grande do Sul, 18 June 2004 (recorded by G.N.M.).

have one or two Blackish Neutral Gray bars or dots. Lesser upper wing coverts Dark Brownish Olive with most feathers having a Cinnamon bar between blackish bars, the terminal one narrower. Some lesser upper wing coverts of the left wing are Dark Neutral Gray. The greater upper wing coverts have an intrincated color pattern. Their conspicuous portion is brownish (approaching Prout's Brown, 121A) with an incomplete black bar on the outer web, approximately in the middle of the feather, and its distal portion is marked by a Cinnamon bar between two black bars, the terminal one narrower (Figure 3); there is a black line close to the margin along the outer web. The outermost primary coverts are Dark Brownish Olive on the margin of the outer web, being tipped blackish, while its insconspicuous portion (most part of the feather) is Sepia (near 219); at the distal margin of the Sepia-colored portion there is a black mark parallel to the rachis. Alula Sepia (near 219) with brownish areas on the outer web. Upper surface of remiges Sepia (near 219), with most part of the outer web edged brownish (approaching Prout's Brown, 121A). The 10th primary has brownish areas on the outer web. The 9th secondary is brownish (approaching Prout's Brown, 121A) with an incomplete subterminal black bar, from which originates a black line that follow close to the margin along the outer web. The subterminal black bar is partially edged by an irregular Cinnamon line (on the outer web) which is followed by a small terminal black dot. There is a limited central black line along the rachis. The 8th secondary is similar to the preceding, but the subterminal black bar is more pronounced. The 7th secondary is mainly Sepia, with a terminal pattern over the outer web composed by a large black dot which is followed by a small irregular Cinnamon line and an inconspicuous apical blackish spot. This pattern is much more restricted in the next two secondaries; the rest of these feathers are like the other remiges. Five remiges of the left wing are Blackish Neutral Gray without brownish margin. In the same wing, there are small whitish areas on the tip of three remiges. Under surface of remiges near Sepia (219) with a lustrous shine; there are brownish areas on the outer web of the 10th primary. Chin Light Neutral Gray (85), throat and breast between Medium Neutral Gray and Light Neutral Gray, the breast sides being Medium Neutral Gray. Belly Pale Neutral Gray (near 86) anteriorly, posteriorly becoming whitish on the center; all belly feathers have a Dark Neutral Gray distal margin. Flanks and extreme lower belly Cinnamon barred blackish, the feathers toward the rump tending to Cinnamon Brown (33), being also barred. Most flank bars extends along the feather margin parallel to the rachis. Between the flanks and the belly there is a transitional barring pattern, where the Cinnamon and the blackish bars become lighter, there being feathers which are barred whitish and gray. Under tail coverts barred blackish and Cinnamon. Tibial feathers are either Medium Neutral Gray with Cinnamon bars or alternately barred Cinnamon and blackish. Loral feathers are Medium Neutral Gray with a faint brownish wash, being tipped Dark Neutral Gray. Feathers around eyes Pale Neutral Gray tiped Dark Neutral Gray. Sides of head and neck Medium Neutral Gray. The basal portion of the rachis of

Table 2. Measures of selected variables of songs and calls of taxa in the *Scytalopus speluncae* group: pace (notes per second), song duration (in seconds), frequency (in kHz) and note length (in seconds). Frequency values refers to the fundamental of individual notes. Values shown are range and mean ± standard deviation. *Scytalopus speluncae* is divided into southern and northern populations according to Maurício (2005).

Species / Characters	*S. diamantinensis*	*Scytalopus* sp. nov.	*S. pachecoi*	*S. novacapitalis*	southern *S. speluncae*	northern *S. speluncae*	*S. iraiensis*
Song[1]	n = 10 individuals and 31 songs	n = 8 individuals and 18 songs	n = 95 individuals and 98 songs	n = 6 individuals and 8 songs	n = 41 individuals and 43 songs	n = 5 individuals and 5 songs	n = 6 individuals and 8 songs
Pace	2.76-4.35 (3.39 ± 0.38)	2.24-2.96 (2.71 ± 0.20)	2.01-3.36 (2.7 ± 0.27)	1.03-1.19 (1.1 ± 0.063)	4.56-5.86 (5.06 ± 0.31)	5.17-5.74 (5.44 ± 0.26)	4.05-5.8 (4.82 ± 0.61)
Duration	11.95-233 (28.55 ± 21.84)	9.38-102 (45.25 ± 18.84)	32-300 (102.8 ± 55.31)	194-743 (361.5 ± 215.2)	26-165 (86.5 ± 42.72)	-	54-298 (167.2 ± 98.7)
Frequency – upper limit	2.4-4.3 (3.6 ± 0.26)	3.6-4.9 (4.4 ± 0.17)	4.1-6.4 (4.93 ± 0.4)	2.7-3.5 (3.14 ± 0.22)	3.7-5.5 (4.62 ± 0.4)	2.3-5.1 (3.83 ± 1.24)	2.3-3.4 (2.87 ± 0.35)
Note length	0.028-0.061 (0.048 ± 0.004)	0.037-0.058 (0.048 ± 0.003)	0.032-0.062 (0.048 ± 0.005)	0.076-0.102 (0.09 ± 0.006)	0.029-0.056 (0.047 ± 0.006)	0.052-0.072 (0.064 ± 0.007)	0.024-0.044 (0.032 ± 0.006)
Accelerating song[2]	n = 3 individuals and 5 songs	n = 1 individual and 3 songs	n = 10 individuals and 12 songs	n =1-2 individuals and 3 songs	-	-	-
Pace of the initial section	3.02-3.69 (3.36 ± 0.29)	2.8-3.0 (2.85 ± 0.1)	2.64-3.17 (2.89 ± 0.2)	1.0-1.2 (1.12 ± 0.12)	-	-	-
Pace of the transition section	2.78-3.31 (2.97 ± 0.3)	4.97-5.47 (5.24 ± 0.26)	3.51-6.71 (4.93 ± 1.1)	2.45-3.6 (2.86 ± 0.64)	-	-	-
Pace of the trilled section	6.32-8.82 (7.31 ± 1.15)	7.99-8.24 (8.11 ± 0.13)	6.03-10.1 (8.49 ± 1.42)	7.03-9.66 (8.73 ± 1.47)	-	-	-
Duration of the entire song	15.72-24.48 (18.73 ± 2.3)	13.81-22.51 (17.27 ± 4.6)	12.5-23.0 (18.86 ± 3.53)	31.1-54.5 (40.67 ± 12.28)	-	-	-
Duration of the transition section	2.76-7.9 (5.06 ± 2.54)	1.6-2.0 (1.77 ± 0.21)	1.1-4.83 (2.87 ± 1.28)	2.22-7.76 (4.76 ± 2.79)	-	-	-

Species / Characters	*S. diamantinensis*	*Scytalopus* sp. nov.	*S. pachecoi*	*S. novacapitalis*	southern *S. speluncae*	northern *S. speluncae*	*S. iraiensis*
Duration of the trilled section	3.98-6.57 (5.18 ± 1.12)	3.63-6.78 (5.45 ± 1.63)	0.65-7.26 (3.3 ± 1.89)	2.73-4.55 (3.6 ± 0.91)	-	-	-
Frequency (trilled section) – upper limit	2.3-4.8 (3.4 ± 0.92)	4.2-4.6 (4.4 ± 0.14)	4.6-5.8 (5.31 ± 0.3)	4.4-4.7 (4.49 ± 0.09)	-	-	-
Note length (trilled section)	0.022-0.032 (0.027 ± 0.003)	0.037-0.04 (0.38 ± 0.001)	0.028-0.039 (0.034 ± 0.003)	0.029-0.034 (0.031 ± 0.001)	-	-	-
Alarm call[3]	n = 12 individuals and 234 calls	n = 2 individuals and 48 calls	n = 8 individuals and 154 calls	n = 2 individuals and 41 calls	n = 7 individuals and 110 calls	n = 2 individuals and 11 calls	-
Pace	8.06-15.18 (11.92 ± 1.33)	8.44-11.53 (9.54 ± 0.24)	6.13-9.8 (7.86 ± 0.94)	12.9-15.6 13.64, 14.71	6.38-10.43 (8.55 ± 1.07)	2.65-6.69 2.98, 6.44	-
Frequency – upper limit	1.6-3.9 (2.46 ± 0.45)	2.0 -2.4 (2.2 ± 0.58)	1.8-2.3 (2.09 ± 0.14)	3.1-3.7 (3.3 ± 3.58)	3.6-4.6 (3.93 ± 0.27)	1.8-2.0 (1.8 ± 2.0)	-
Note length	0.014-0.041 (0.028 ± 0.005)	0.034-0.048 (0.039 ± 0.001)	0.031-0.047 (0.039 ± 0.004)	0.023-0.036 (0.024 ± 0.034)	0.041-0.069 (0.053 ± 0.008)	0.072-0.096 (0.073 ± 0.094)	-

[1] Number of recordings adequate for measurements of song duration (complete and nearly complete recorded series of notes) were as follows: 31 for *S. diamantinensis* (only songs with 40 or more notes were considered), Scytalopus sp. nov. 18, 63 for *S. pachecoi*, 27 for southern *S. speluncae*, none for northern *S. speluncae*, eight for *S. iraiensis* and six for *S. novacapitalis*. Frequency and note length measurements were not possible for five songs of *S. diamantinensis*, 11 songs of *Scytalopus* sp. nov., seven songs of *S. pachecoi* and one of southern *S. speluncae*. For further information on methodological procedures concerning song measurements, see "METHODS" above.

[2] This song type is absent from the vocal repertory of both southern and northern *S. speluncae* and from that of *S. iraiensis*. Pace measurements are given separately for each of the three distinct sections of this song type: first section (main part of the song); transition (when inter-note intervals become increasingly shorter before the pace stabilize into the final section); and trilled section (accelerated final section of the song). Two recordings of *S. pachecoi* were too incomplete for measurements of the total duration of this song type. The values of frequency and note length presented for this song refers only to the trilled section. For *S. pachecoi* measurements of frequency and note length were not possible in four songs.

[3] For *Scytalopus sp. nov., novacapitalis* and northern *S. speluncae* the values shown after range are the mean of the measures obtained for each of the two individuals whose calls were available. The number of alarm call notes was variable: *S. diamantinensis* = 3-10, most often five; *Scytalopus* sp. nov. = 3-7, most often five; *S. pachecoi* = 3-7, most often four; *S. novacapitalis* = 6-12, most often nine; southern *S. speluncae* = 3-9, most often five; northern *S. speluncae* = 1-4, most often 2-3.

the underside of remiges are whitish. Wing bend Clay Color (near 123B) with Medium Neutral Gray distal margins. Under wing coverts anteriorly Light Neutral Gray with a wide subterminal Clay Color band; posteriorly, the under wing coverts are entirely Light Neutral Gray. Axillars Warm Buff (near 118), some of them with a faint gray barring. Central rectrices brownish (approaching Prout's Brown, 121A) with small areas Sepia (near 219) and small Cinnamon dots. Outer rectrices Sepia (near 219) with small Cinnamon dots and variable extensions of brownish (near Prout's Brown, 121A), this latter color mainly on outer web.

The holotype has 10 primaries, 9 secondaries and 12 rectrices in a rather graduated tail. Its Pteryla spinalis (pterylosis of the dorsal tract) extends posteriorly to the base of the tail and the Pteryla ventralis is undivided in the flank margin. Tarsal scutellation of the taxaspidean type. Sternum with four notches (the "type 6 sternum" of Heimerdinger and Ames 1967). Syrinx compressed dorsoventrally, with no fusion of elements. The Membranae tracheales are present both dorsally and ventrally and the Processi vocales are narrow and relatively long bars. The syringeal musculature is composed only by the extrinsic pairs of muscles Tracheolateralis and Sternotrachealis. There are no intrinsic muscles. Soft parts colors: iris dark brown; bill black with brownish areas; mandibular commissure brownish; tarsus and toes brownish on the outer surface and yellowish-brown (with brownish areas) on the inner surface; under surfaces of the toes yellowish-brown; claws yellowish with light-brownish base, that of the hallux being dark-brownish with a yellowish tip. Molt: no molt. Cranial ossification: skull almost unossified. Fat: moderate amount of fat. No gonads were detected. Bill 6.0 mm; exposed culmen 11.9 mm; bill depth 4.7 mm; wing (chord) 52.4 mm; tail 43.3 mm; tarsus 19.7 mm; wing span 174.0 mm; body mass 16.3 g.

Variation in the type series. The remaining three males in the type series are in adult or subadult plumages, showing a much simpler and distinct general color pattern in comparison to the holotype. Therefore, we present a detailed description of an adult male paratype, to which the remaining males are compared. MCP 1900: crown, nape, dorsal surface of neck, back, upper wing covers, scapulars and upper tail coverts Blackish

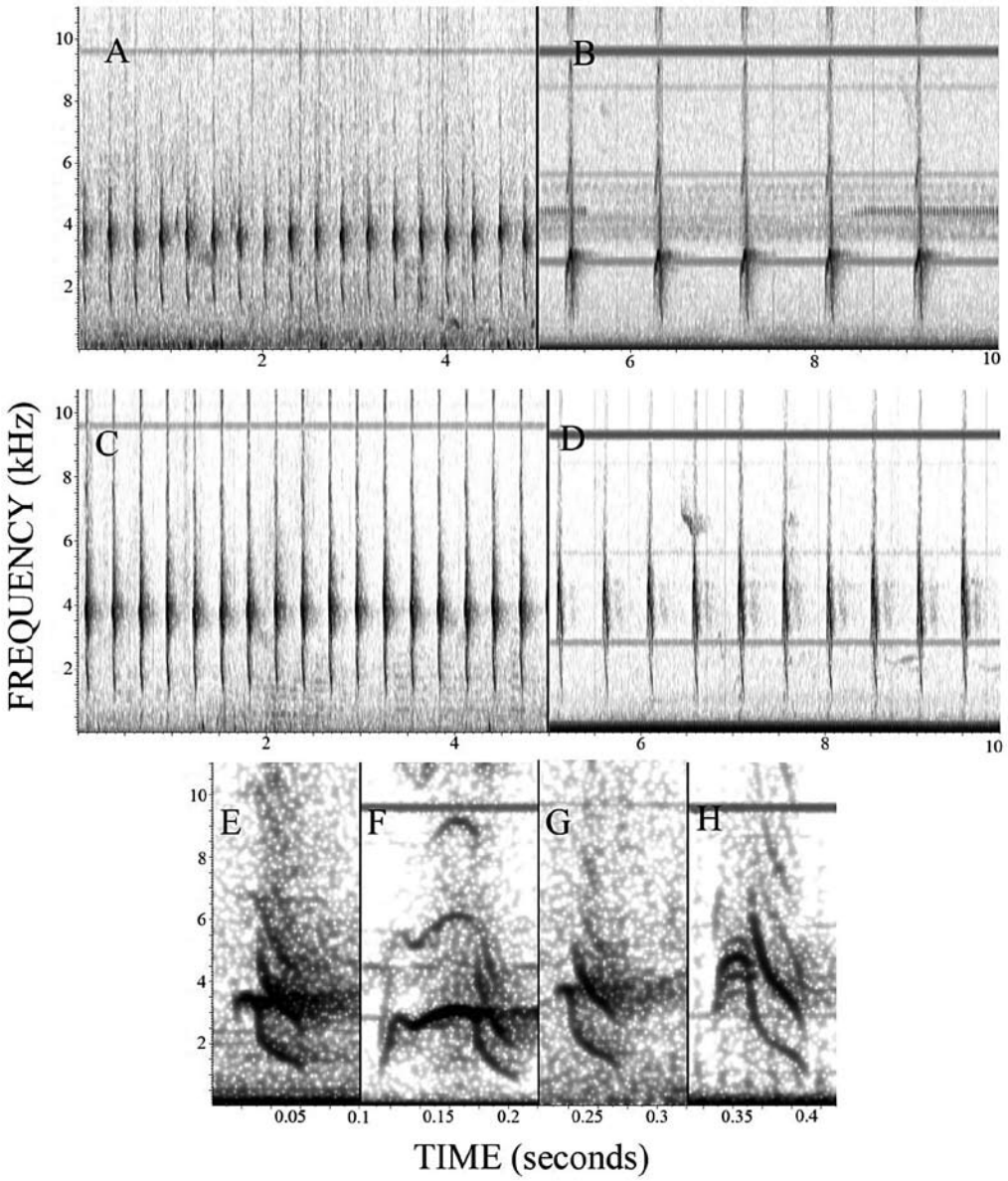

Figure 6. Spectrograms of part of the songs and song notes of four species of *Scytalopus*. **A.** *S. diamantinensis*, Campo Redondo, within the Serra do Sincorá, municipality of Ibicoara, state of Bahia, 20 August 2006 (after playback); adult male (MCP 1900, paratype) (recorded by R.B.-L.). **B.** *S. novacapitalis*, Ribeirão do Gama, Brasília, Distrito Federal, 17 July 2004 (after playback); adult male (MCP 1481) (recorded by G.N.M.). **C.** *Scytalopus* sp. nov., near the village of Palmital, Serra do Palmital, municipality of Bocaina de Minas, state of Minas Gerais, 2 December 2004 (after playback); male (MCP 1509) (recorded by M.R.B.). **D.** *S. pachecoi*, Santa Eulália, municipality of Morro Redondo, state of Rio Grande do Sul, 26 October 2001 (after playback) (recorded by G.N.M.). **E**, **F**, **G**, and **H.** Detail of single song notes from the same songs shown in spectrograms A to D (E = *S. diamantinensis*, F = *S. novacapitalis*, G = *Scytalopus* sp. nov., and H = *S. pachecoi*).

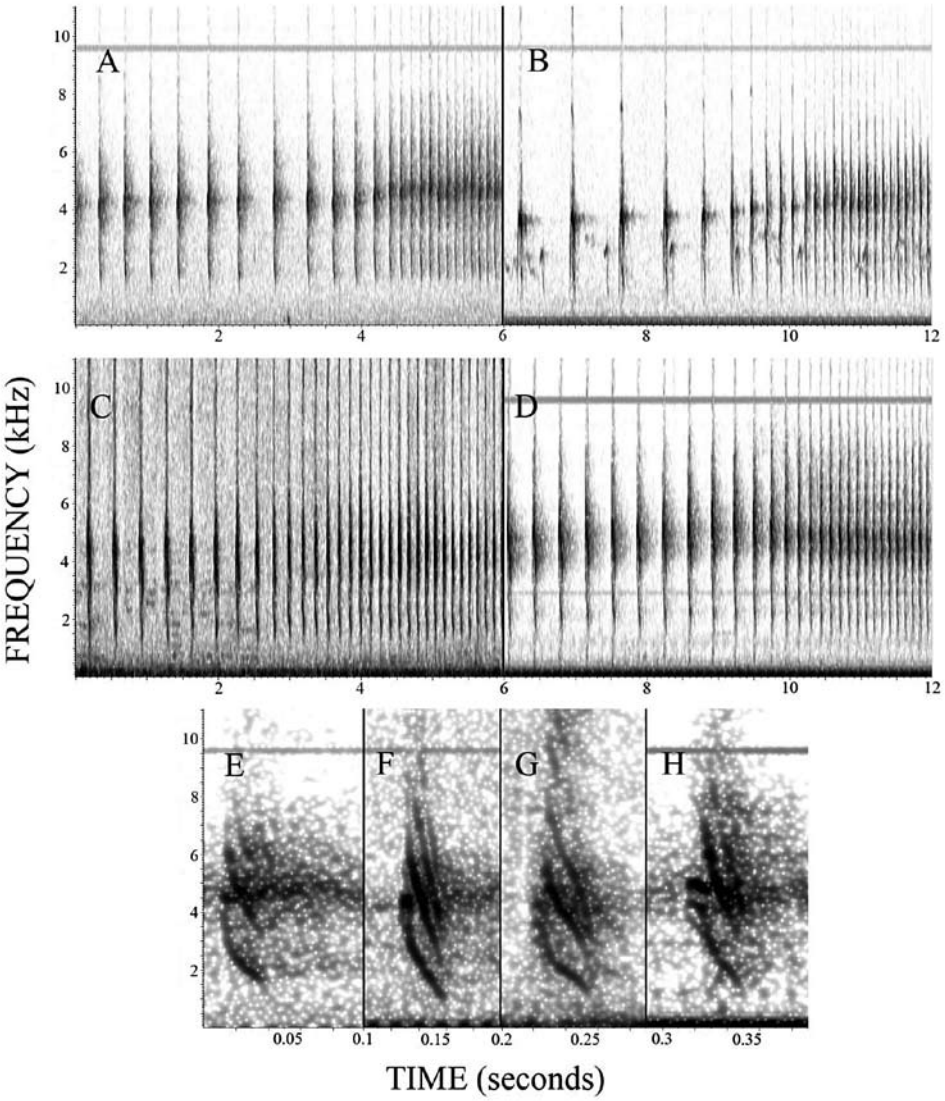

Figure 7. Spectrograms of part of the accelerating songs and song notes of four species of *Scytalopus*. **A.** *S. diamantinensis*, Morros de Ouro, municipality of Barra da Estiva, state of Bahia, 26 August 2006 (after playback) (recorded by R.B.-L.). **B.** *S. novacapitalis*, Reserva Ecológica do IBGE, Brasília, Distrito Federal, 24 September 1981 (after playback) (recorded by J. Vielliard). **C.** *Scytalopus* sp. nov., Pico Dois Irmãos (or Serra Grande), Rio Preto State Park, municipality of São Gonçalo do Rio Preto, state of Minas Gerais, 17 May 2004 (after playback); female (uncatalogued specimen at the Departamento de Zoologia of the Universidade Federal de Minas Gerais) (recorded by M.R.B.). **D.** *S. pachecoi*, Cerro das Almas, municipality of Capão do Leão, state of Rio Grande do Sul, 29 December 2001 (after playback); presumed adult female (identified by plumage) (recorded by G.N.M.). In each example, the initial section is not shown. **E**, **F**, **G**, and **H.** Detail of single song notes from the trilled final section shown in spectrograms A to D (E = *S. diamantinensis*, F = *S. novacapitalis*, G = *Scytalopus* sp. nov., and H = *S. pachecoi*).

Neutral Gray; forehead feathers near Dark Neutral Gray edged Blackish Neutral Gray; rump Blackish Neutral Gray washed Raw Umber (near 223) anteriorly and, posteriorly, barred with blackish and Mars Brown and blackish and Raw Sienna (near 136); some scapulars and upper tail coverts show a faint barring of Mars Brown; chin Light Neutral Gray; throat, breast and belly Medium Neutral Gray, some feathers of central belly having a Pale Neutral Gray subterminal margin; flanks near Mars Brown and Cinnamon, being marked by conspicuous blackish bars, most of which extends along the feather margin parallel to the rachis; extreme lower belly and under tail coverts Cinnamon barred blackish; lores Medium Neutral Gray with a faint brownish wash, the feathers being edged Dark Neutral Gray; feathers around eyes Pale Neutral Gray tipped Blackish Neutral Gray; sides of head and neck Dark Neutral Gray; upper surface of remiges and rectrices Blackish Neutral Gray; old feathers tend to be Sepia (near 219); inner remiges are Sepia (near 219), some of them having irregular brownish and blackish areas; one inner remige on each wing have, on the outer web, a terminal blotch composed by a Cinnamon bar partially surrounded by black; under surface of remiges Dark Neutral Gray with a lustrous shine; the basal portion of the rachis of the underside of the outermost primaries are whitish; under surface of rectrices Sepia (near 119); under wing coverts Medium Neutral Gray; axillar feathers Medium Neutral Gray washed light brownish; tibial feathers Medium Neutral Gray, some of which having a brownish tip and others blackish and Cinnamon terminal bars; there is a white feather on the right side of the head. Morphological aspects of the adult male MCP 1900 are like those of the holotype, with exception of the number of secondaries, since there is a rudimentary tenth inner secondary. Soft parts colors: iris as in the holotype; bill predominantly blackish with some brownish areas; mandibular commissure yellowish; tarsus and toes (including the plantar surface of toes) as in the holotype; claws brownish with yellowish margins. Molt: several under tail coverts, some tectrices over the back and neck and the forth rectrix of the right side. Cranial ossification: skull almost as ossified as the maximum degree observed in a *Scytalopus* species (in a lesser degree than depicted for *S. iraiensis* in Bornschein *et al*. 1998). Fat: small amount of fat. Testes: left 7.0 x 5.0 mm; right 6.0 x 4.0 mm. Bill 6.1 mm; exposed culmen 11.7 mm; bill depth 4.5 mm; wing (chord) 50.5 mm; tail 42.0 mm; tarsus 19.5 mm; total length 131.0 mm; wing span 173.0 mm; body mass 16.0 g.

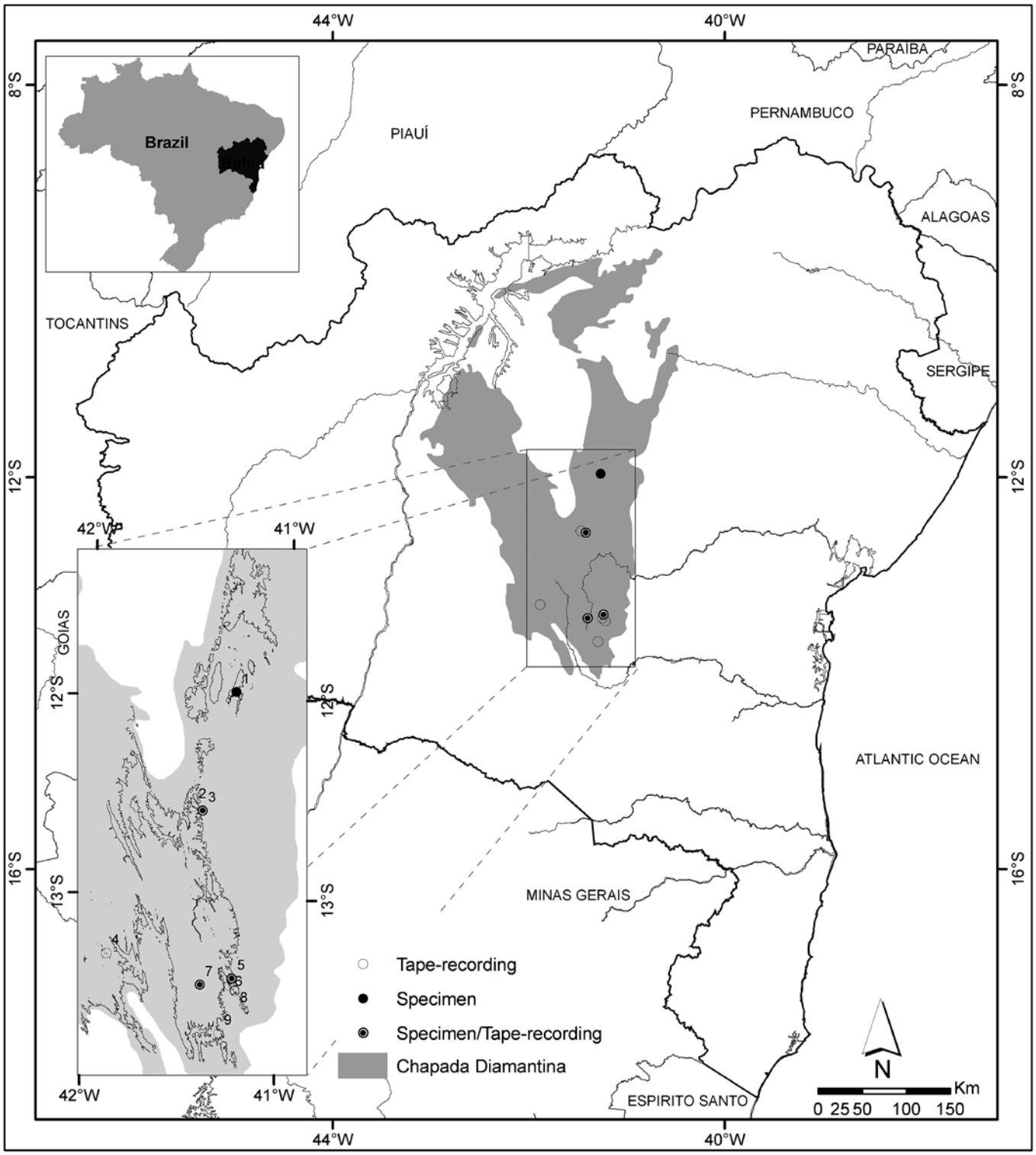

Figure 8. Distribution of *Scytalopus diamantinensis*, as confirmed by examination of specimens and tape-recordings (state of Bahia, northeastern Brazil). The insert at lower left shows the same localities (numbered from north to south) as the larger map and areas above 1,000 m a.s.l. (gray line). Gray areas of both maps represent the delimitation of the Chapada Diamantina geomorphological unit (according IBGE 1993). 1. Rodovia Bonito/Utinga, km 6 (11°59'52"S, 41°13'37"W), municipality of Bonito. 2. Rio Ribeirão (12°33'S, 41°28'W; c. 850 m a.s.l.), Chapada Diamantina National Park, municipality of Lençóis. 3. Serra do Ribeirão (12°34'S, 41°25'W; c. 850 m a.s.l.), municipality of Lençóis. 4. Sítio Santa Teresinha (13°18'S, 41°53'W; c. 1400-1600 m a.s.l.), at the base of Pico do Barbado, Catolés, municipality of Abaíra. 5. Campo Redondo (13°24'09"S, 41°14'09"W; c. 1.050 m a.s.l.), within the Serra do Sincorá, municipality of Ibicoara. 6. Near Ibicoara (13°26'22"S, 41°14'47"W; c. 1015 m a.s.l.), within the Serra do Sincorá, municipality of Ibicoara. 7. Capão do Vale (13°26'24"S, 41°23'54"W; c. 1.200 m a.s.l.; type-locality), municipality of Ibicoara. 8. Bonfim (13°27'53"S, 41°13'04"W; c. 1130 m a.s.l.), within the Serra do Sincorá, municipality of Iramaia. 9. Morros de Ouro (13°40'49"S, 41°17'31"W; c. 1135 m a.s.l.), municipality of Barra da Estiva.

The paratypes MCP 1898 and MZUSP 77827 are similar to the preceding one, differing as follows. MCP 1898: upper tail coverts and some scapulars with a faint wash of Mars Brown; central belly feathers without Pale Neutral Gray subterminal margins; flanks and lower belly more extensively Mars Brown, barred blackish; the Cinnamon color is more restricted to the extreme lower belly; loral feathers Pale Neutral Gray, edged Dark Neutral Gray, with some feathers on the left side washed brownish; inner remiges almost plain colored, with only a faint brownish wash; axillars Clay Color; soft parts colors: mandibular commissure whitish, tarsus and toes brownish-yellow with brownish areas, claws light-brownish, tending to yellowish, with that of the hallux brownish with light-brownish tip; molt: a few feathers on the back; cranial ossification: skull as ossified as the maximum degree observed in a *Scytalopus* species (as depicted for *S. iraiensis* in Bornschein *et al*. 1998); testes: left 11.0 x 6.0 mm; right 10.0 x 6.0 mm; bill 6.7 mm; exposed culmen 12.5 mm; bill depth 4.6 mm; wing (chord) 55.3 mm; tail without the central pair; tarsus 20.9 mm; wing span 186.0 mm; body mass 16.0 g. MZUSP 77827: upper tail coverts like those of MCP 1898; rump like MCP 1900, except that the color patters are more extensive; scapulars like MCP 1898; breast is lighter than in MCP 1900 and belly is near Light Neutral Gray; rectrices Sepia (near 219); three inner remiges in each wing have a terminal blotch like that described for MCP 1900; axillars like those of MCP 1898; soft parts colors: bill black with a brownish area over the mandible; mandibular commissure, tarsus and toes like MCP 1898; molt: some feathers of the upper and under tail coverts were in molt; fat: as in the holotype; testes: (right or left) 9.0 x 4.0 mm; bill 6.3 mm; exposed culmen 12.5 mm; bill depth 4.5 mm; wing (chord) 53.0 mm; tail 45.1 mm; tarsus 20.7 mm; total length 139.0 mm; wing span 183.0 mm; body mass 17.2 g. In morphological aspects, the paratypes MCP 1898 and MZUSP 77827 are similar to the holotype.

The female paratype MCP 1897 is very distinct from adult males, showing a complex color pattern; its upperparts are mainly brownish (near Dark Brownish Olive in most parts; the posterior rump is Cinnamon), the feathers being edged blackish and usually marked by a blackish central dot (wider on the scapulars and lower back); its wings are patterned like in the holotype, though having a less conspicuous overall appearance, with bars and lines being generally narrower; throat and upper breast Medium Neutral Gray with some feathers washed buffish; chin feathers, lower breast and belly Chamois (near 123D), the feathers having a blackish margin and (except for the chin) a more internal blackish mark variable in shape; the barring pattern over the flanks, sides of body and rump is more extensive than in the holotype. A more detailed description of female plumage will be presented in a separate publication. In morphological aspects MCP 1897 is like the holotype; soft parts colors: iris as in the holotype; upper mandible blackish, lower mandible brownish; mandibular commissure yellowish-brown; tarsus and toes brownish-yellow with brownish areas; plantar surface of the toes like MCP 1900; claws mostly light-brownish, that of the hallux being blackish with a brownish lower edge; molt: some molt over the body, except on the belly; some molting feathers also within wing and tail coverts; cranial ossification: as in MCP 1898; fat: as in MCP 1900; ovary: 5.0 x 4.0 mm; bill 5.8 mm; exposed culmen 11.3 mm; bill depth 4.3 mm; wing (chord) 49.7 mm; tail 43.6 mm; tarsus 19.9 mm; total length 134.0 mm; wing span 172.0 mm; body mass 15.3 g.

Systematic relationships. With the purpose of assessing the systematic position and genetic distinctiveness of *S. diamantinensis* we used part of the data from a broader study on the phylogeny of the Brazilian *Scytalopus* (H.M. *et al*. in prep.). Here we present preliminary results based on around 550 base pairs (bp) from the second subunit of the NADH dehydrogenase gene (ND2), obtained from two *S. diamantinensis* individuals (MCP 1896 and 1898; GenBank accession numbers EF608554 and EF608553, respectively) collected at two localities separated by a straight line distance of around 100 km. All known Brazilian *Scytalopus* species are represented in this dataset: *S. speluncae* (n = 33), *S. iraiensis* (n = 4), *S. novacapitalis* (n = 2), *S. pachecoi* (n = 21), "*S." indigoticus* (n = 9), "*S." psychopompus* (n = 2), and *Scytalopus* sp. nov. (n = 13). In addition, we have also included sequences from one individual of the following outgroup taxa: *S. stilesi*, *S. magellanicus*, *Merulaxis ater*, *Psilorhamphus guttatus*, *Eugralla paradoxa* and *Myornis senilis*.

Phylogenetic analyses (maximum parsimony, maximum likelihood, and Bayesian inference) consistently recovered, with high statistical support, a monophyletic group formed by *S. diamantinensis*, *S. novacapitalis*, *S. pachecoi*, and *Scytalopus* sp. nov., although the exact position of *S. diamantinensis* within this group could not be established with confidence. The two specimens of *S. diamantinensis* sequenced had slightly different haplotypes (c. 0.1% sequence divergence), but always grouped together in the phylogenies produced. *Scytalopus diamantinensis* is genetically distinct from all other Brazilian *Scytalopus*, the smaller sequence divergence (uncorrected distances) observed being 3.5% (17 transitions and 1 transversion substitutions) between *S. diamantinensis* and *S. novacapitalis*. From the other two species in its clade *S. diamantinensis* differed by higher sequence divergence levels: 5.0% and 4.5% for *S. pachecoi* and *Scytalopus* sp. nov., respectively. These values are similar to those found among sister species of *Scytalopus* (Cuervo *et. al*. 2005; H.M. *et al*. in prep.). In addition, the above phylogenetic results were further corroborated by preliminary analyses which included 884 additional base pairs of the nuclear β-fibrinogen intron 7 (β-fibint 7) and a 1507 bp combined dataset (ND2+β-fibint 7).

These results are fully congruent with the hypothesis (Maurício 2005) that the light-gray Brazilian *Scytalopus* having accelerating songs in their vocal repertories, namely *S. novacapitalis*, *S. diamantinensis*, *Scytalopus* sp. nov., and *S. pachecoi*, form a monophyletic group.

Geographical distribution. The new species is known exclusively from the Chapada Diamantina geomorphological unit

(cf. IBGE 1993), state of Bahia, Brazil. In the mountains to the east-southeast of this range (about 145 km straight line distance), within the state of Bahia (e.g. Serra da Ouricana and nearby highlands), the only true *Scytalopus* recorded is a taxon closely related to *S. speluncae* (M.R.B., G.N.M. and R.B.-L., unpublished data; see Gonzaga *et al*. 1995; see "*Endemism, distribution and habitat*" below). We documented *S. diamantinensis* with vouchers (specimens and tape-recordings) at eight localities (Figure 8). Sítio Santa Teresinha, the westernmost locality known for the species, is the only site located outside the eastern slopes of Chapada Diamantina where *S. diamantinensis* has been recorded.

Apart from general locality designations found in the literature (e.g. "Lençóis", "Ibicoara" and "Bonito"; *cf*. Maurício 2005, under *Scytalopus* sp., and Raposo *et al.* 2006, under *S. speluncae*), *S. diamantinensis* was previously known from only three localities. Parrini *et al*. (1999) reports the new species (as *Scytalopus* sp.) from the "Chapada Diamantina National Park (old road between the towns of Palmeiras and Lençois [sic])" and "Fazendas Horizonte and Terramater (near town of Ibicoara)". Two specimens at Museu Nacional (MN 43053, 43054) were collected at "Rodovia Bonito/Utinga, km 6, Bonito" (11°59'52"S, 41°13'37"W; Figure 8). The northernmost and southernmost localities reported here for *S. diamantinensis* are separated by 186 km.

Etymology. The specific name for the new taxon, *diamantinensis*, refers to the Chapada Diamantina, the geological unit to which *S. diamantinensis* is restricted.

Vocalizations. The vocal repertoire of *S. diamantinensis* is composed by the song, a variant of the song (accelerating song), and three types of calls (alarm call, monosyllabic call and bissyllabic call). The song consists of the repetition of a single note lasting 0.028-0.061 s (mean 0.048, SD ± 0.004), which can be transliterated as "tcheep… tcheep...", in series that can last from a few seconds up to almost four minutes (Figure 6a). The song notes always showed an audible fundamental whose frequency ranged from 0.8-1.4 (mean 1.1, SD ± 0.1) (lowest frequency or "bottom" of the fundamental) to 2.4-4.3 kHz (mean 3.6, SD ± 0.26) (uppermost limit of frequency or "top" of the fundamental) and also an equally loud overtone (Table 2). The song note starts with a slight upward frequency modulation, which may be more evident in some examples than in others (being almost absent in some cases), and shows a clear downward frequency modulation in the final part (Figure 6e). The song pace varies from 2.76 to 4.35 notes per second (mean 3.39, SD ± 0.38) (Table 2). See table 2 for the complementary data.

Some songs (n = 18, from eight individuals) showed one to six (most often five) introductory "warming" notes (sometimes nasal in quality) delivered at a pace of 4.02-6.87 notes per second (mean 5.19, SD ± 1.09), therefore faster than the main section of the song (Figure 9c). The "warming" notes are shaped like the remaining song notes but are shorter (ranging from 0.019-0.073 s, mean 0.042, SD ± 0.01) and lower pitched, with the fundamental varying from 0.9-1.5 kHz (mean 1.1, SD ± 0. 18) to 1.5-3.3 kHz (mean 2.3, SD ± 0.53). We also recorded very short sequences of song notes (n = 27, from 12 individuals) lasting 0.08-12.13 s (mean 6.18, SD ± 3.56), with a pace ranging from 3.08 to 7.25 notes per second (mean 3.93, SD ± 0.82) and having from three to 37 notes (these short sequences of notes were discarded for song measurements; see methods above). These short songs were given 2.7-12 s after or before longer song sequences or alarm call series had been delivered.

One short song (same individual of Figure 5a) showed distinct, perhaps aberrant notes (Figure 9c), whose shape resembled the notes of alarm call of *S. pachecoi* (Figure 5d) and the multi-note call (other than the alarm call) of *Scytalopus* sp. nov. (Figure 9d , see "Remarks on vocal data" below). These notes (n = 5) were delivered amongst typical – "warming"– notes and ranged in frequency from 1.0 to 1.3-1.5 kHz, with note length ranging 0.028-0.039 s.

The accelerating song consists of the repetition of a note into three distinctly paced sections: a initial section, a transition section and a fast, trilled final section. The initial section has a pace between 3.02 and 3.69 notes per second (mean 3.36, SD ± 0.29), with notes ranging in frequency from 1.0-1.5 (mean 1.2, SD ± 0.14) to 3.7-4.5 kHz (mean 4.0, SD ± 0.28) and lasting 0.035-0.051 s (mean 0.044, SD ± 0.004) (Table 2). The transition section has a pace between 2.78 and 3.31 notes per second (mean 2.97, SD ± 0.3), whose notes ranges in frequency from 1.1-1.8 (mean 1.3, SD ± 0.27) to 3.8-4.9 kHz (mean 4.2, SD ± 0.4) and lasts 0.033-0.051 s (mean 0.043, SD ± 0.006) (Table 2). The trilled section has a pace between 6.32 and 8.82 notes per second (mean 7.31, SD ± 1.15), with frequency ranging from 1.2-1.5 (mean 1.3, SD ± 0.27) to 2.3-4.8 kHz (mean 3.4, SD ± 0.92), each note lasting 0.022-0.032 s (mean 0.027, SD ± 0.003) (Table 2). See table 2 for the complementary data. The note of the accelerating song is spectrographically similar to the song note, although it lacks the initial upward frequency modulation. A slight variation in note length occurs throughout the song: in the initial section the note is shorter than the note of non-accelerating songs, and then there is a slight decrease in the transition section and a conspicuous decrease in length in the trilled section. Most accelerating songs were heard from confirmed or presumed females; in one occasion, one presumed male delivered this song type.

The alarm call is composed by two to nine notes, most often five notes, lasting 0.014-0.041 s (mean 0.028, SD ± 0.005) which ranges in frequency from 0.8-1.7 (mean 1.2, SD ± 0.17) to 1.6-3.9 kHz (mean 2.46, SD ± 0.45) (Figure 5a, Table 2). The shape of the notes typically resemble (though there is substantial individual variation) that of *S. novacapitalis* alarm call, showing an abrupt downward frequency modulation. In some examples, the first note of the alarm call is higher-pitched than the others. The total duration of this call varies between 0.06 and 0.98 s (mean 0.43, SD ± 0.155). See table 2 for the complementary data.

The short "tcheep" call (n = 30, from five individuals),

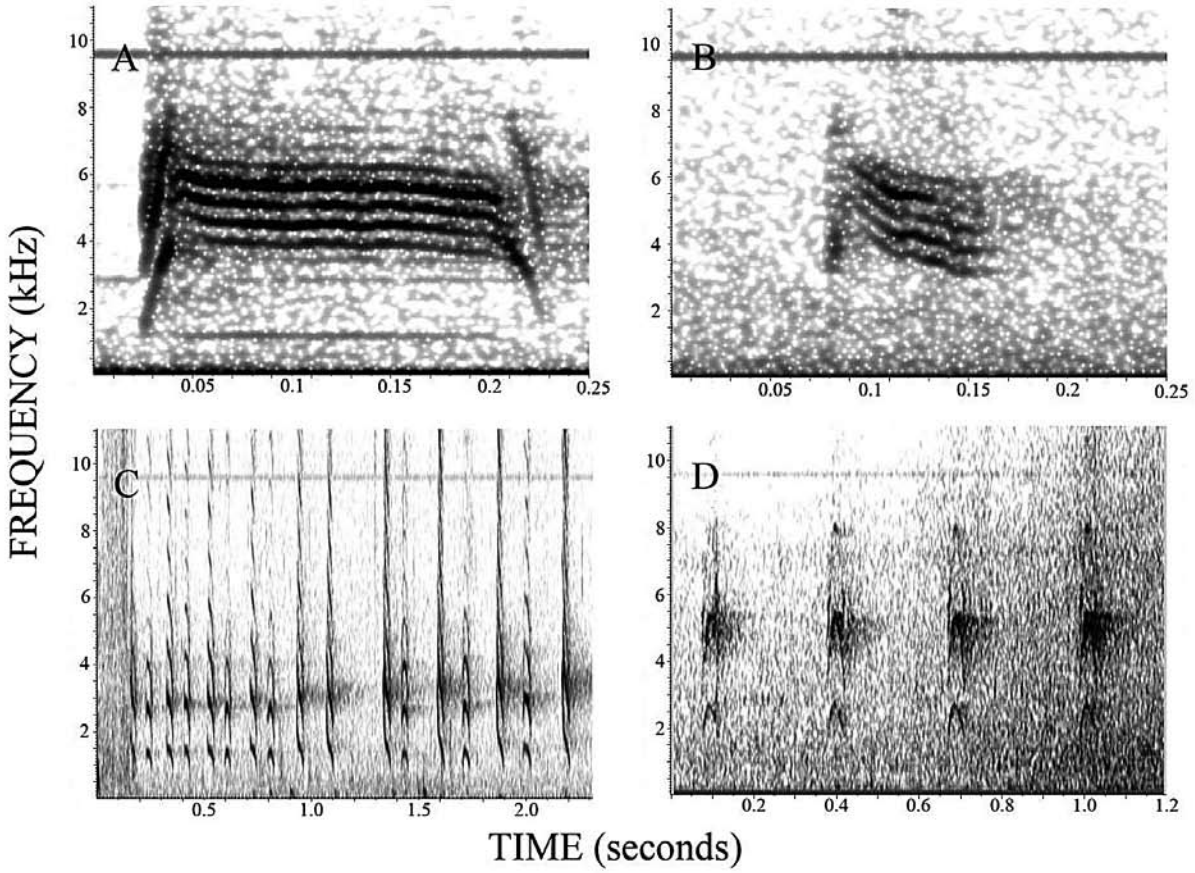

Figure 9. Spectrograms of selected vocalizations of three species of *Scytalopus*. **A.** *S. pachecoi*, contact call ("*pzeen*"), Cerro das Almas, municipality of Capão do Leão, state of Rio Grande do Sul, 14 September 2002 (unsolicited); immature male (MCP 1082, paratype) (recorded by G.N.M.). **B.** *Scytalopus* sp. nov., monosyllabic (contact?) call, Sítio Ponte Velha, right bank of Rio das Mortes, municipality of São João del Rei, state of Minas Gerais, 26 May 2005 (recorded by V. Torga). **C.** *S. diamantinensis*, "warming" notes (including anomalous notes) of the beginning of song, Morros de Ouro, municipality of Barra da Estiva, state of Bahia, 26 August 2006 (after playback) (recorded by R.B.-L.). **D.** *Scytalopus* sp. nov., multi-note call (other than alarm call), Pico Dois Irmãos (or Serra Grande), Rio Preto State Park, municipality of São Gonçalo do Rio Preto, state of Minas Gerais, 17 May 2004 (after playback) (recorded by M.R.B.). This multi-note call (D) lasts 2 s or less and apparently starts with a faster pace, but only the second half (shown here) was tape-recorded.

which probably is a contact call, consists of one note whose spectrographic signature is similar to that of the song note, differing from the latter in lacking the upward frequency modulation and in being typically higher-pitched (Figure 4a, b). Its length varies from 0.037 to 0.065 s (mean 0.048, SD ± 0.008) and the frequency ranges from 1.0-1.6 (mean 1.2, SD ± 0.2) to 3.6-6.0 kHz (mean 4.8, SD ± 0.73). We heard from three different individuals another type of call, composed by two notes; it was tape-recorded from two birds (n = 9 calls, one of them having an additional, third note). The first note is a high-pitched "tcheep" reaching 3.1-6.1 kHz (mean 4.5, SD ± 0.16; lower limit: 1.2-1.5 kHz, mean 1.3, SD ± 0.1) and lasting 0.023-0.047 s (mean 0.035, SD ± 0.011), while the second is a shorter (range 0.019-0.034 s, mean 0.24, SD ± 0.006) and lower-pitched note (upper limit: 2.7-4.9 kHz, mean 3.8, SD ± 1.06; lower limit: 1.1-1.5 kHz, mean 1.3, SD ± 0.13) (Figure 4c, d). In all examples of this call the first note was conspicuously higher-pitched and longer than the last one; in the case with three notes, the last two notes were equally shorter and lower-pitched. The pace of this call varies from 9.17 to 10.64 (mean 9.73, SD ± 0.63) notes per second, and its total duration ranges from 0.11 to 0.24 s (mean 0.14, SD ± 0.045).

All five types of vocalizations recorded from the new species were delivered both under natural (i.e. no playback involved) and post-playback situations. After the song, heard in a total of 35 (out of 37) individual encounters (a bird recorded several times in the same day represents one individual encounter, but if a given bird was recorded in two different days two individual encounters are considered), the most common voice was the "tcheep" call, which was detected during 15 individual encounters. The doble-note call was heard only during three individual encounters. The alarm call and the accelerating song were detected in 13 and five individual encounters, respectively.

Natural history. *Scytalopus diamantinensis* inhabit forests (canopy 10-25 m tall) ("Floresta Estacional Semidecidual Montana", *sensu* Veloso *et al*. 1991, IBGE 1992) and young and old second growth (*capoeira*), where forest at early suc-

cessional stages is recovering from loging. It occurs frequently in low *capoeira* (2-2.5 m tall) dominated by the fern *Pteridium aquilinum* (Pteridaceae), and where young growing trees are absent or very rare. In this type of habitat shading of soil is intense, in part due to the presence of a layer of dead leaves 0.5-1 m thick covering the ground. Taller *capoeira* (canopy 3-5 m tall) with more extensive tree regeneration and less abundant (or even absent) *P. aquilinum* is also occupied by the new species. *S. diamantinensis* was also registered once in "campo rupestre" adjacent to forest (see "*Endemism, distribution and habitat*" below), though this bird was heard mainly (in consecutive days) in a contiguous patch of *capoeira*. This individual vocalized spontaneously from bushes (1.5-2 m tall) in a "campo rupestre" with dense herbaceous vegetation (c. 0.8-1.5 m tall), but shortly after returned to the *capoeira*. The habitats occupied by *S. diamantinensis* varied from steep slopes to almost flat terrain (e.g. at bottom of river valleys), in altitudes ranging from 850 to 1600 m a.s.l.

Scytalopus diamantinensis favours habitats with a great density of plants and stems, such as bamboo (Poaceae) patches, masses of dead leaves of *P. aquilinum*, and fallen stems (Figure 2). It moves on the ground and lower vegetation strata (up to 2 m above the ground), in the latter case using horizontal, vertical and inclined small-diameter stems for perching. It also frequently walks on fallen trunks and branches. We observed *S. diamantinensis* taking only short flights over gaps no more than 5 m wide.

During fieldwork (August), the species was vocal throughout the day, but most frequently in the first and last hours of the day. Males were much more commonly detected than females (or presumed females), which were observed mainly alone, but in some occasions forming pairs with males. Like other tapaculos, *S. diamantinensis* is most often heard than seen.

DISCUSSION

Species limits. It has been demonstrated that the traditional morphology/plumage-based approach (e.g. Chapman 1915; Zimmer 1939) alone is not sufficient to define species limits within *Scytalopus*, and that vocalizations and molecular markers (e.g. mtDNA) are the most useful sources of characters for the resolution of the taxonomy of the genus (Arctander and Fjeldså 1994; Krabbe and Schulenberg 1997, 2003; Cuervo *et al*. 2005; Krabbe *et al.* 2005). In a recent revision of the genus presented by Krabbe and Schulenberg (1997), the main source of characters used to delimit species were vocalizations. However, these authors recognized as distinct (biological) species only those taxa (allopatric or not) whose songs were distinct, being reluctant in recognize taxa on the basis of call distinctions alone, arguing that song is more important in species-recognition and pair-formation than calls (presumably assuming that songs are better predictors of reproductive isolation/compatibility than calls). This approach is particularly problematic regarding its applicability to the *S. speluncae* group, whose species are generally allopatric and share a similar song type composed by the long repetition of the same simple note, with the main interspecific variation occurring in pace, note length and frequency (Maurício 2005). For example, in two species so highly distinct ecologically (Bornschein *et al*. 1998), genetically (H.M. *et al*. in prep.) and, to a lesser degree, morphologically, as *S. iraiensis* and *S. speluncae*, the differences between their songs are minimal (with several parameters generally overlapping in range; see Bornschein *et al*. 1998 and Maurício 2005) while they differ notably from one another in calls. Additionally, playback experiments showed that they respond to each other's songs (Bornschein *et al*. 1998). The little interspecific song variation in this species-group is particularly contrasting with that observed among most Andean *Scytalopus* species groups. The interspecific song variation within a clade composed by four northern Andean allopatric species (*S. stilesi*, *S. rodriguezi*, *S. robbinsi* and an undescribed species) is very high, but less so their calls (Cuervo *et. al*. 2005, Krabbe *et al*. 2005). Song variation within the clade composed by *S. diamantinensis*, *S. novacapitalis*, *S. pachecoi* and *Scytalopus* sp. nov. (all allopatric taxa) is comparatively more subtle, with the more divergent species being *S. novacapitalis*, whose song differs consistently (no overlap) in two parameters (pace and note length) from the other taxa (Table 2). There are mean differences, with variable range overlap, in song parameters (pace and frequency) between *S. diamantinensis* and *S. pachecoi* and *Scytalopus* sp. nov., although there are some non-overlapping differences in the accelerating song (Table 2). However, the vocal repertory viewed as a whole diagnoses all four taxa unambiguously, mainly due to a substantial variation in calls (see below).

If the criteria of Krabbe and Schulenberg (1997) is applied to the *S. speluncae* group, at least *S. diamantinensis*, *S. pachecoi* and *Scytalopus* sp. nov. would probably be lumped into a single polytypic biological species. We focus on diagnosability to delimit species (phylogenetic species; see Cracraft 1983, Zink and McKitrick 1995), no matter to which extent (if any) differences in calls contribute to pre-mating reproductive isolation. Therefore, we recognize all four allopatric taxa with accelerating songs as distinct (phylogenetic) species. Furthermore, the mean differences in songs and consistent differences in calls in this clade are strongly correlated not only with clear genetic distinctions, but also with plumage differences. Although adult males of *S. pachecoi* and *S. diamantinensis* are not separable by plumage, at a younger stage (immature plumage, as defined below; see also Maurício 2005) they show distinct plumage features. The former species has a color pattern over the wing coverts not observed in any other Brazilian *Scytalopus*, while the latter has a pattern very similar to that found in *S. speluncae* immatures (two wide black wing bars); the Serra do Espinhaço populations (only one possibly comparable individual was examined) show a wing pattern most similar to that of *S. diamantinensis*, but with some distinctions that probably are diagnostic (see Figure 3). Some plumage

features of juvenile plumages (mainly barring patterns) were presented by Whitney (1994) as diagnostic for some Andean *Scytalopus*, though he recognized that large sample sizes are important in establishing the diagnosability with confidence. The importance and usefulness of immature plumages to diagnose taxa in *Scytalopus* should be better explored in future taxonomic studies.

Remarks on vocal data. The song and "call" of *S. diamantinensis* and *Scytalopus* sp. nov. were analyzed by Raposo *et al.* (2006), who grouped them without distinction in a monotypic *S. speluncae*. These authors described the song of *S. speluncae* (*sensu* Raposo *et al.* 2006), as having a mean pace of 2.5 notes per second, each note lasting (mean) about 0.03 s with a fundamental frequency between 1.8 and 2.0 kHz. The values of note length presented by Raposo *et al.* (2006) are much lower than the mean values found in the present study, whereas the values for the "fundamental frequency" given by the authors probably refer to the frequency´s lower limit. In our study, we found that the lower limit of the song note fundamental frequency is 0.8-1.4 kHz in *S. diamantinensis* and 0.9-1.3 kHz (mean 1.0, SD ± 0.06) in *Scytalopus* sp. nov. while the upper limit (for both species) is always above 2.3 kHz (Table 2).

The other voice described by Raposo *et al.* (2006) for their *S. speluncae* is a monosyllabic call treated by the authors as a "call" or "alarm-call". The authors indicated that a call was recorded from birds at two areas within the Chapada Diamantina, presenting an example taken in São João del Rei (southeastern state of Minas Gerais, thus representing *Scytalopus* sp. nov.) in their Figure 16. However, since the authors treated *S. diamantinensis* and *Scytalopus* sp. nov. as a single species, we suggest that under the "call" of Raposo *et al*. (2006) there are more than just one voice type, including the "tcheep" call described above (see "*Vocalizations*") and the call of *Scytalopus* sp. nov, the latter never heard by us from *S. diamantinensis*. The authors mentioned that the call of their *S. speluncae* is "identical to the call described by Maurício (2005) for *S. pachecoi*", but this a mistake. The call described by Maurício (2005) for *S. pachecoi* (labeled as a contact call) has a length between 0.109 and 0.232 s (mean 0.159) and that reported by Raposo *et al*. (2006) has a mean duration of 0.07 s. We analyzed three examples of the monosyllabic call of *Scytalopus* sp. nov. from São João del Rei sent us by Vitor Torga (presumably including the example illustrated by Raposo *et al*. 2006) and this call indeed is shorter (ranging from 0.085 to 0.087; n = 3) than the call of *S. pachecoi*. Although the call of these two species are similar in their general harmonic structure (Figure 9 a, b), that of *Scytalopus* sp. nov. shows an evident overall downward frequency modulation not observed in the relatively large sample (n = 152 calls, from 12 individuals) analyzed from *S. pachecoi* (see appendix and Maurício 2005). Additionally, the call of *Scytalopus* sp. nov. sounds distinct, lacking the metalical quality characteristic of *S. pachecoi*.

M.R.B. heard from *Scytalopus* sp. nov. a second type of multi-note call (other than the alarm call), which probably does not exist in the repertory of *S. diamantinensis* and, therefore, could be seen as another diagnostic vocal character between both species. This voice was heard twice at the same locality (Pico do Itambé; January 2004; see appendix) from two different individuals, once spontaneously and once after playback. This call lasts 2 s or less, being apparently faster paced in the first than in the final half. Unfortunately, only the second half of a call was tape-recorded (Figure 9). The duration of the recorded section is 0.95 s, representing four notes (the pace of this section is 3.3 notes per second). Each note starts in an uprising frequency modulation, ending up in a downward frequency modulation. The lower limit of those notes is 2.0 kHz, with the upper limit ranging from 2.6 to 2.8 kHz (mean 2.7, SD ± 0.96), and length between 0.035 and 0.038 s (mean 0.036, SD ± 0.001). This call may be the same described by Willis and Oniki (1991:55) for their *S. novacapitalis* from Serra do Cipó (i.e. our *Scytalopus* sp. nov.).

Age and reproductive conditions. For comparative purposes, the skin specimens analyzed were grouped into four age/plumage categories, following Fjeldså and Krabbe (1990): juvenile, immature, subadult and adult. The juvenile is the first plumage, being entirely or predominantly brown (dark brown on the upperparts and light brown to cinnamom below) and barred/spotted with black or blackish over the head and body (including wings and tail). The definitive, adult plumage is characterized (at least in males) by plain-colored wings (without light marks), the remaining parts being gray or blackish, with some species (e.g. *S. novacapitalis*, *S. diamantinensis*, *Scytalopus* sp. nov. and *S. pachecoi*) having brown/cinnamom flanks barred to some variable extension with black. Between these two extremes are the intermediate immature and subadult plumages. The former is mainly gray (instead of brown), with or without a brownish wash on the upperparts, always having conspicuous dark and light spots or bars over the inner remiges and upper wing coverts, forming conspicuous wing bars; they generally are paler than adults or subadults below, with the central belly generally having light gray or silvery feather-tips. We regarded as subadults those birds with mainly gray plumage, without wing bars, but with conspicuous light/dark marks over the inner remiges. For examples of these four plumage stages in *Scytalopus* see plate XLI (e.g. pictures 4a, b and c, 5a and b, 10a and b) in Fjeldså and Krabbe (1990).

We consider that the cranial pneumatization of *S. diamantinensis* is incomplete, such as in other *Scytalopus* species (Krabbe and Schulenberg 1997, Bornschein *et al*. 1998), and that the maximum level of pneumatization described for *S. iraiensis* (Bornschein *et al*. 1998) is approximately the maximum observed in the new species.

The paratypes MCP 1898 and 1900 are adult males, though the latter appears to be older if considered the level of cranial pneumatization, while the paratype MZUSP 77827 is presumably younger (subadult) since it shows clear terminal blotches over some inner remiges. The gonads of the holotype MCP 1896 were not detected during specimen's preparation, but we assume that it is an immature male judging from its almost

unossified skull and plumage color (predominantly grayish upper parts, a condition that distinguishes it from females, which are mostly brownish).

Judging from plumage color the female (MCP 1897) presumably is a subadult bird. Based upon our knowledge on other species of Brazilian *Scytalopus* it is not expected that *S. diamantinensis* adult females would retain a light brown ventral coloration such as that observed on the collected female. Its ventral area with gray feathers is very restricted and ends abruptly, while the brownish ventral area is expanded and have an unusual light tinge. We believe that this specimen has a transitional plumage stage. We observed in the field two presumed females with mainly gray under parts.

The immature male and female collected were not in a reproductive condition (small gonads and absence of brood patch in the female). The subadult and adult males had testes with intermediate sizes (the left, bigger testes measured from 7 to 11 mm in length), suggesting that they were starting or ending the reproductive season. In southeastern and southern Brazil the breeding season of Passeriformes typically starts in September-October and extends to January-February (pers. obs.). Therefore, the collection of our series of *S. diamantinensis* (late August) might have taken place at the onset of the species' breeding season.

Endemism, distribution and habitat. The Serra do Espinhaço is a 50-100 km wide and several hundred kilometers long orographic massif comprising areas above 800 m a.s.l., extending from northern Bahia south to the Ouro Preto region, in southeastern Minas Gerais (Moreira 1965 *apud* Giulietti and Pirani 1988). Areas with lower altitudes divide Serra do Espinhaço into several high-elevation segments, which receive distinct names, such as Serra do Sincorá, Serra do Grão-Mogol, Serra do Cabral, Serra do Cipó and Serra do Caraça (Giulietti and Pirani 1988). We follow Derby (1966) and Giulietti and Pirani (1988) in considering the Chapada Diamantina as part of the Serra do Espinhaço massif. Its most characteristic vegetation type is the so-called "campo rupestre", which is nearly restricted to high elevations, rarely occurring below 800 m (Harley 1988). This savanna-like formation occurs in the states of Bahia, Minas Gerais and (disjunctly) Goiás, representing 2.5% of the area covered by the *cerrado* region (Dias 1996). The *campo rupestre* is not a homogeneous formation, but rather a mosaic of plant communities under the control of local topography, angle of declivity, microclimatic influences and substrate nature (Giulietti and Pirani 1988). At lower elevations the Serra do Espinhaço may support other vegetation types, such as *caatinga* (mainly in Bahia) and *cerrado* (mainly in Minas Gerais), which are widely distributed beyond that range (Giulietti and Pirani 1988, Harley 1988). Additionally, on its eastern slopes there are extensive forests consisting of inland extensions of the Atlantic forests typical of the coastal ranges. Although supporting this wide variety of vegetation types, the most striking avifaunal elements of the Serra do Espinhaço are the endemic taxa associated with the *campo rupestre*. These taxa are *Augastes lumachella* (Hooded Visorbearer), *Augastes scutatus* (Hyacinth Visorbearer) and *Asthenes luizae* (Cipó Canastero); while the first-named taxon is restricted to the Chapada Diamantina, the other two species are confined to the Minas Gerais section of the Serra do Espinhaço (Silva 1995, Sick 1997, Stattersfield *et al*. 1998, Bencke *et al*. 2006). Other three taxa, *Scytalopus* sp. nov., *Polystictus superciliaris* (Grey-backed Tachuri) and *Embernagra longicauda* (Pale-throated Serra-finch) were previously considered endemic to the Serra do Espinhaço (Silva 1995, Bencke *et al.* 2006), a status no longer supported by recent findings (Vasconcelos *et al.* 2003; this study – see below). *Scytalopus diamantinensis* is an additional endemic species of this range, being the only forest bird restricted to the Serra do Espinhaço (see below).

As far as known, the distribution of *S. diamantinensis* is much more restricted than that of some sympatric taxa whose ranges are confined to the forests of the southeastern quarter of Bahia and adjacent Minas Gerais, such as *Synallaxis cinerea* (Bahia Spinetail) and *Phylloscartes beckeri* (Bahia Tyrannulet). In addition to the Chapada Diamantina eastern slopes (see Parrini *et al*. 1999), these two Atlantic forest montane species occur in evergreen forests southeastward, mainly at Serra da Ouricana and Serra das Lontras (see Bencke *et al*. 2006). On the other hand, the representative of the *S. speluncae* group in these hills is not *S. diamantinensis*, but instead an undescribed *Scytalopus* closely related to *S. speluncae* (also called "Bahia Mouse-colored Tapaculo" in the internet) and presently under study by some colleagues (see "*Geographical distribution*" above; see also Gonzaga *et al*. 1995). It is important to note that the avifauna of the Chapada Diamantina forests includes several bird species endemic to the Atlantic forest (see Parrini *et al*. 1999), suggesting that the new tapaculo could be regarded a taxon endemic to the Atlantic forest biome instead of to the *cerrado* biome.

The shortest distance between the southernmost known locality for *S. diamantinensis* (Morros de Ouro) and our nearest record for a taxon in its clade is 545 km. This record, which refers to *Scytalopus* sp. nov., was obtained at Pico Dois Irmãos (or Serra Grande), state of Minas Gerais (initially by M.R.B. and posteriorly also by R.B.-L. and M. F. de Vasconcelos, when specimens were collected and tape-recorded) (see appendix). Unlike *S. diamantinensis*, *Scytalopus* sp. nov. is not restricted to a single geomorphological unit since it also occurs outside the Serra do Espinhaço in the Serra da Mantiqueira, where it was registered by M.R.B., G.N.M. and C. A. F. R. Gatto near the Itatiaia National Park (specimens collected and tape-recorded near the village of Palmital, state of Minas Gerais; see appendix).

Scytalopus diamantinensis is a strict forest species, whereas *Scytalopus* sp. nov. inhabits both forest and non-forest habitats. The latter taxon regularly occurs in *campo rupestre*, in sites characterized by the presence of small clumps of shrubs (0.8-1.5 m tall) scattered over vast, rather open rocky areas distant (more than 400 m) from any forest habitat (M.R.B., G.N.M. and R.B.-L. pers. obs.). The only record of *S. diaman-*

tinensis we obtained in *campo rupestre* (see "*Natural history*" above) was in an area adjacent to an extensive forested slope.

Conservation. The habitat of *S. diamantinensis* is naturally restricted in the Chapada Diamantina region. The natural landscape is dominated by *cerrado*, *caatinga*, *campo rupestre* and wet fields, for example. The human population in Chapada Diamantina is mostly rural (73%; CAR 1997a), implying that the native forests are under a great pressure for timber extraction. Deforestation frequently also occurs for agriculture, especially to give way for coffee plantations. Another threat is posed by the local slash-and-burn agriculture and pasture renewal practices, which have been altering the forested cover (both primary and secondary ones) in the the entire region, with extensive areas being burnt annually by out-of-control fires. Forest areas may be destroyed or suffer an area retraction because of fire effects (Oliveira *et al*. 2000, Ribeiro *et al.* 2002, Pereira *et al.* 2004). So, it is not surprising that most of Chapada Diamantina forests have been destroyed and that the remaining patches are very disturbed. The new species occurs within the 152,000 ha Chapada Diamantina National Park (see "*Geographical distribution*" above), established in 1985. However, continuous human activities in the park, such as forest removal (CAR 1997b), jeopardize its conservation within this protected area.

In the extensive rocky massif arround Pico do Barbado, the highest point of the state of Bahia, there are some forest remnants apparently covering relatively large areas (e.g. more than 100 ha) above 1,400 m a.s.l., some of which appear to be in good condition. We believe that this general area can hold an important population of *S. diamantinensis* (at least three territories were found in the only remnant we visited) although the entire region has been or will be severely fragmented by forest clearance and large scale governamental projects and increasing non-sustainable ecotourism (E. da Cunha Gonçalves, pers. com.). The implementation of conservation actions in this region is urgently needed. The creation of private reserves such as the *Reserva Particular do Patrimônio Natural* (RPPN), a type of private conservation unit reconized by the Brazilian law, is a possible way to contribute to the conservation of important areas for the new species. Such an initiative is being planed by E. da Cunha Gonçalves, who acquired the area around Pico do Barbado where we found *S. diamantinensis*.

According to The World Conservation Union (IUCN; in BirdLife International 2000) criteria, *S. diamantinensis* would be considered Vulnerable. However, more knowledge about distribution, population size and ecology of *S. diamantinensis* is needed to access more accurately its conservation status.

ACKNOWLEDGEMENTS

The Fundação O Boticário de Proteção à Natureza provided financial support for the fieldwork in Bahia, through a project conducted by Liga Ambiental (0308/2005OA). Also provided support and helped with loan of equipment, Bianca L. Reinert, Aline Montagna da Silveira, Fred and Anna L. Bornschein and Thaís Belmonte. Ticcolor Vídeo Foto Som Ltda. covered part of photographic material costs. Liris C. C. Robert helped in the fieldwork in Bahia. Erasmo da Cunha Gonçalves helped to locate *S. diamantinensis* in his property and shared with us important information on the conservation of native habitats in the Pico do Barbado area. Marcelo F. de Vasconcelos and Cassiano A. F. R. Gatto helped during fieldworks with *Scytalopus* sp. nov., and Mauro Pichorim during fieldwork with *S. novacapitalis*. The Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) send collecting permits to G.N.M. and M.R.B. (031/2006 – COFAN). The Instituto Estadual de Florestas (IEF) of the state of Minas Gerais, send research and collecting authorization for three state parks to M.R.B. (003/04, 004/04 and 005/04). Carlos Daniel Cadena send NADH dehydrogenase gene (ND2) sequences of *Eugralla paradoxa*, *Myornis senilis, Scytalopus magellanicus and S. stilesi.* Vitor Torga and Jacques M. E. Vielliard send vocalizations of *Scytalopus* sp. nov. and *S. novacapitalis*, respectively. André P. Antunes and the Laboratório de Herpetologia of the Instituto de Biologia of the Universidade Estadual Paulista helped with the spectrograms. Tom Grando Jr. and Gislaine Cova Grando lend a stereoscopic microscopy. Tiago Carvalho helped with some photographs. Everton L. L. de Quadros, Arlete I. Pascualetto and Glayson A. Bencke, of the Fundação Zoobotânica do Rio Grande do Sul, elaborated the map of geographical distribution of *S. diamantinensis*. G.N.M. is supported by a doctoral fellowship (process number 141149/2006-0) from the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). Genetic data was obtained by a CNPq grant to S.L.B. Luiz A. Pedreira Gonzaga (DZUFRJ), Marcos A. Raposo and Jorge B. Nacinovic (MNRJ), Herculano Alvarenga (MHNT), Luís Fábio Silveira (MZUSP), Pedro Scherer-Neto (MHNCI) and G. A. Bencke (MCN) kindly allowed examination of specimens in the collections under their care. The authors are grateful to Alexandre Aleixo and L. F. Silveira for their critical review of the manuscript and to Rafael A. Dias for reviewing some parts of the text.

REFERENCES

Ames, P. L. (1971) The morphology of the syrinx in passerine birds. *Bull. Peabody Mus. Nat. Hist. Yale Univ. Bull.* no. 37.

Arctander, P. and J. Fjeldså (1994) Andean tapaculos of the genus *Scytalopus* (Aves, Rhinocryptidae): a study of speciation using DNA sequence data, p. 205-225. In: V. Loeschcke, J. Tomiuk and S. K. Jain (eds.) *Conservation Genetics*. Switzerland: Birkhäuser Verlag Basel.

Bencke, G. A. and G. N. Maurício (2006) Abordagem metodológica/Methodological approach, p. 63-90. In: G. A.

Bencke, G. N. Maurício, P. F. Develey and J. M. Goerck (eds.) *Áreas importantes para a conservação das aves no Brasil. Parte I – estados do domínio da Mata Atlântica.* São Paulo: SAVE Brasil.

BirdLife International. 2000. *Threatened Birds of the World*. Barcelona and Cambridge: Lynx Editions and BirdLife International.

Bornschein, M. R., B. L. Reinert and M. Pichorim (1998) Descrição, ecologia e conservação de um novo *Scytalopus* (Rhinocryptidae) do sul do Brasil, com comentários sobre a morfologia da família. *Ararajuba* 6: 3-36.

_____, _____ and D. M. Teixeira (1995) *Um novo Formicariidae do sul do Brasil (Aves, Passeriformes)*. Publicação Técnico-Científica do Instituto Iguaçu de Pesquisa e Preservação Ambiental, n. 1. Rio de Janeiro: Instituto Iguaçu de Pesquisa e Preservação Ambiental.

Cannell, P. F. (1988) Techniques for study of avian syringes. *Wilson Bull.* 100: 289-293.

CAR (1997a) *Programa de desenvolvimento regional sustentável – PDRS: Chapada Diamantina*. Salvador: Companhia de Desenvolvimento e Ação Regional – CAR.

_____ (1997b) *Subespacialização regional: Chapada Diamantina; programa de desenvolvimento regional sustentável*. Salvador: Companhia de Desenvolvimento e Ação Regional – CAR.

Chapman, F. M. (1915) The more northern species of the genus *Scytalopus* Gould. *Auk* 32: 406-423.

Cracraft, J. (1983) Species concepts and speciation analysis. *Curr. Ornithology* 1: 159-187.

Cuervo, A. M., C. D. Cadena, N. Krabbe and L. M. Renjifo (2005) *Scytalopus stilesi*, a new species of tapaculo (Rhinocryptidae) from the Cordillera Central of Colombia. *Auk* 122: 445-463.

Derby, O. A. (1966) The Serra of Espinhaço, Brazil. *Journal of Geology* 14: 374-401.

Dias, B. F. de S. (1996) Cerrados: uma caracterização, p. 11-25. In: B. F. de S. Dias (ed.). *Alternativas de desenvolvimento dos cerrados: manejo e conservação dos recursos naturais renováveis*. Brasília: FUNATURA – Fundação Pró Natureza.

Fjeldså, J. and N. Krabbe (1990) *Birds of the high Andes*. Svendborg: Zoological Museum, University of Copenhagem and Apollo Books.

Giulietti, A. M. and J. R. Pirani (1988) Patterns of geographic distribution of some plant species from the Espinhaço range, Minas Gerais and Bahia, Brazil, p. 39-69. In: P. E. Vanzolini and W. R. Heyer (eds.). *Proceedings of a workshop on Neotropical distribution patterns*. Rio de Janeiro: Academia Brasileira de Ciências.

Gonzaga, L. P., and G. Castiglioni (2001) *Aves das montanhas do sudeste do Brasil*. CD. Rio de Janeiro: Arquivo Sonoro Prof. Elias Coelho, Universidade Federal do Rio de Janeiro – UFRJ.

_____, J. F. Pacheco, C. Bauer and G. D. A. Castiglioni (1995) An avifaunal survey of the vanishing montane Atlantic forest of southern Bahia, Brazil. *Bird Conserv. Intern.* 5: 279-290.

Harley, R. M. (1988) Evolution and distribution of *Eriope* (Labiate), and its relatives, in Brazil, p. 71-120. In: P. E. Vanzolini and W. R. Heyer (eds.). *Proceedings of a workshop on Neotropical distribution patterns*. Rio de Janeiro: Academia Brasileira de Ciências.

Heimerdinger, M. A. and P. L. Ames (1967) Variation in the sternal notches of suboscine passeriform birds. *Postilla* 105: 1-44.

IBGE (1992) *Manual técnico da vegetação brasileira*. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística - IBGE . Série Manuais Técnicos em Geociências nº. 1.

_____ (1993) *Mapa de unidades de relevo do Brasil*. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística - IBGE.

Krabbe, N., P. Salaman, A. Cortés, A. Quevedo, L. A. Ortega and C. D. Cadena (2005) A new species of *Scytalopus* tapaculo from the upper Magdalena Valley, Colombia. *Bull. B.O.C.* 125: 93-108.

_____ and T. S. Schulenberg (1997) Species limits and natural history of *Scytalopus* tapaculos (Rhinocryptidae), with descriptions of the Ecuadorian taxa, including three new species, p. 47-88. In: J. V. Remsen, Jr. (ed.) *Studies in Neotropical Ornithology honoring Ted Parker*. Washington: The American Ornithologist's Union (Ornithological Monographs 48).

_____ and _____ (2003) Family Rhinocryptidae (tapaculos), p. 748-787. In: J. del Hoyo, A. Elliott and D. A. Christie (eds.) *Handbook of the birds of the world. Volume 8: Broabills to tapaculos*. Barcelona: Lynx Edicions.

Maurício, G. N. (2005) Taxonomy of southern populations in the *Scytalopus speluncae* group, with description of a new species and remarks on the systematics and biogeography of the complex (Passeriformes: Rhinocryptidae). *Ararajuba* 13: 7-28.

Oliveira, D. dos S. de, A. C. Batista and M. S. Milano (2000) Fogo em unidades de conservação, p. 200-207. In: II

Congresso Brasileiro de Unidades de Conservação, Vol. II: Trabalhos Técnicos. *Anais*. Campo Grande: Rede Nacional Pró Unidades de Conservação; Fundação O Boticário de Proteção à Natureza.

Parrini, R., M. A. Raposo, J. F. Pacheco, A. M. P. Carvalhães, T. A. Melo Jr., P. S. M. Fonseca and J. C. Minns. (1999) Birds of the Chapada Diamantina, Bahia, Brazil. *Cotinga* 11: 86-95.

Pereira, C. A., N. C. Fiedler and M. B. de Medeiros (2004) Análise de ações de prevenção e combate aos incêndios florestais em unidade de conservação do cerrado. *Floresta* 34: 95-100.

Raposo, M. A., R. Stopiglia, V. Loskot and G. M. Kirwan (2006) The correct use of the name *Scytalopus speluncae* (Ménétriés [sic], 1835), and the description of a new species of Brazilian tapaculo (Aves: Passeriformes: Rhinocryptidae). *Zootaxa* 1271: 37-56.

Ribeiro, G. A., G. S. Lima and L. de Siqueira (2002) O Parque Nacional da Serra da Canastra e a ocorrência de incêndios florestais, p. 473-479. In: III Congresso Brasileiro de Unidades de Conservação. *Anais*... Fortaleza: Rede Nacional Pró Unidades de Conservação; Fundação O Boticário de Proteção à Natureza; Associação Caatinga.

Sick, H. (1997) *Ornitologia brasileira*. Rio de Janeiro: Editora Nova Fronteira.

Silva, J. M. C. da (1995) Biogeographic analysis of the South American Cerrado avifauna. *Steenstrupia* 21: 49-67.

Smithe, F. B. (1975) *Naturalist's color guide*. New York: American Museum of Natural History.

Springer, V. G. and G. D. Johnson (2000) Use and advantages of ethanol solution of Alizarin Red S dye for staining bones in fishes. *Copeia* 2000: 300-301.

Stattersfield, A. J., M. J. Crosby, A. J. Long and D. C. Wege (1998) *Endemic bird areas of the world: priorities for biodiversity conservation*. Cambridge: BirdLife International (BirdLife Conservation Series nº. 7).

Straneck, R. (1990) *Canto de las aves de Misiones. II*. Buenos Aires: L.O.L.A. (Literature of Latin America).

Vasconcelos, M. F. de, M. Maldonado-Coelho and D. R. C. Buzzetti (2003) Range extensions for the Gray-backed Tachuri (*Polystictus superciliaris*) and the Pale-throated Serra-finch (*Embernagra longicauda*) with a revision on their geographic distribution. *Ornitologia Neotropical* 14: 477-489.

Veloso, H. P., A. L. R. Rangel-Filho and J. C. A. Lima (1991) *Classificação da vegetação brasileira, adaptada a um sistema universal*. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística - IBGE.

Wassersug, R. J. (1976) A procedure for differential staining of cartilage and bone in whole formalin-fixed vertebrates. *Stain Technology* 51: 131-134.

Whitney, B. M. (1994) A new *Scytalopus* tapaculo (Rhinocryptidae) from Bolivia, with notes on other Bolivian members of the genus and the *magellanicus* complex. *Wilson Bull.* 106: 585-614.

Willis, E. O. and Y. Oniki (1991) Avifaunal transects across the open zones of northern Minas Gerais, Brazil. *Ararajuba* 2: 41-58.

Zimmer, J. T. (1939) Studies of Peruvian birds. No. XXXII. The genus *Scytalopus*. *Amer. Mus. Novitates* 1044.

Zink, R. M. and M. C. McKitrick (1995) The debate over species concepts and its implications for ornithology. *Auk* 112: 701-719.

APPENDIX

Specimens examined (*S. speluncae* species group). For each specimen, locality (when available), municipality (when possible), number of specimens, institution, label number and sex are mentioned (m = male; f = female; ? = sex unknown). *Scytalopus speluncae* is divided into southern and northern populations according to Maurício (2005).

Scytalopus diamantinensis (additional specimens). Brazil. Bahia: Rodovia Bonito/Utinga, km 6, Bonito (2) (MN 43053 [m], MN 43054 [f]), Ibicoara (2) (MN 42741 [m], MN 42472 [f]).

Scytalopus novacapitalis. Brazil. Distrito Federal: Brasília (3) (MN 27906, holotype [m], MN 27905, paratype [?]; also an unsexed paratype in alcohol); Fazenda Água Limpa, Brasília (1) (COMB 2628 [?]); Reserva Ecológica do IBGE, Brasília (1) (MZUSP 71007 [f]); Ribeirão do Gama, near the village of Vargem Bonita, Brasília (1) (MCP 1481 [m]). One additional specimen was examined by M.R.B. in the bird collection of the Reserva Ecológica do IBGE (or Reserva Ecológica do Roncador) in the 1990's; this specimen was not located posteriorly by G.N.M.

Scytalopus sp. nov. Brazil. Minas Gerais: near the village of Palmital (22°11'S, 44°26'W and 22°12'S, 44°27'W), Serra do Palmital, municipality of Bocaina de Minas (2) (MCP 1509 [m], MCP 1510 [m]); Pico do Inficionado, Serra do Caraça, municipality of Catas Altas (3) (MCP 1560 [m], MCP 1561 [m], MCP 1562 [m]).

Scytalopus pachecoi. Brazil. Santa Catarina: edge of Bom Jardim da Serra town (28°20'S, 49°37'W) (2) (MCP 1188 [m], MCP 1190 [m]); Fazenda Rocinha (28°18'S, 49°35'W), municipality of Bom Jardim da Serra (1) (MCP 1183 [m]);

Serra do Rio do Rastro (28°23'S, 49°32'W), at the *Planalto* edge, on the Bom Jardim da Serra/Lauro Müller border (1) (MCP 1189 [m]). Rio Grande do Sul: Arroio Andrade headwaters (31°27'S, 52°28'W), Pelotas/Arroio do Padre municipalities (1) (MCP 962, paratype [m]); Arroio Cadeia (31°35'S, 52°33'W), municipality of Morro Redondo (1) (MCP 959, paratype [m]); upper Arroio Moinho (31°19'S, 52°30'W), municipality of Canguçu (1) (MCP 961, paratype [m]); northern edge of Cambará do Sul town (29°02'S, 50°08'W) (1) (MCP 1075 [m]); Cerro das Almas (31°46'S, 52°35'W), municipality of Capão do Leão (4) (MCP 1179, holotype [m], MZUSP 75761, paratype [m], MZUSP 75762, paratype [m], MCP 1082, paratype [m]); Colônia Solidez (31°18'S, 52°32'W), municipality of Canguçu (1) (MZUSP 75764, paratype [m]); upper reaches of das Contas creek, municipality of São José dos Ausentes (1) (MCP 1016 [m by plumage]); Harmonia (31°18'S, 52°25'W), municipality of São Lourenço do Sul (1) (MCP 1009, paratype [m]); Monte Bonito, at highway BR 392 (31°39'S, 52°27'W), municipality of Pelotas (1) (MCP 1022, paratype [f]); Morro da Antena (31°36'S, 52°31'W), municipality of Pelotas (1) (MCP 960, paratype [m]); Parque Estadual do Turvo (27°14'S, 53°57'W), municipality of Derrubadas (1) (MCP 994 [m]); upper Rio das Antas (28°47'S, 49°58'W), municipality of São José dos Ausentes (3) (MCP 1015 [m], MCP 1040 [m], MCP 1039 [f]); Santo Amor (31°40'S, 52°35'W), municipality of Morro Redondo (2) (MZUSP 75763, paratype [m], MCP 977, paratype [m]); São Gonçalo creek (28°53'S, 50°01'W), municipality of Cambará do Sul (1) (MCP 1043 [m]); near Terra Indígena de Nonoai/Rio da Várzea (27°21'S, 52°57'W), municipality of Nonoai (1) (MCP 1174 [m]).

Scytalopus speluncae (northern populations). Brazil. Minas Gerais: Delfim Moreira (2) (MCP 1172 [m], MCP 1173 [f]); Serra do Caparaó (5) (MN 26267 [m], MN 27035 [m], MN 27036 [m], MN 26281 [m], MN 14202 [m]). Rio de Janeiro: Fazenda Toledo, Nova Friburgo (4) (MN 36652 [m], MN 36655 [f], MN 36653 [f], MN 36656 [f]). Serra do Itatiaia (10) (MZUSP 34804 [m], MZUSP 36347 [m], MZUSP 6121 [m], MZUSP 34381 [m], MZUSP 34807 [f], MZUSP 34805 [f], MZUSP 36349 [f], MZUSP 34806 [?]; MN 14206 [?], MN 14205 [?]). São Paulo: Catuçaba, São Luiz do Paraitinga (4) (MHNT 3057 [m], MHNT 3732 [m], MHNT 3529 [m], MHNT 3733 [m]); Pico dos Marins, Piquete (4) (MHNT 4268 [m], MHNT 4330 [f], MHNT 4327 [?]; MCP 1177 [m]); Guaratinguetá (1) (MHNT 3036 [f]); Pindamonhangaba (1) (MHNT 4356 [f]); Serra do Bananal (1) (MN 25845 [m]).

Scytalopus speluncae (southern populations). Brazil. São Paulo: Alto da Serra (1) (MZUSP 4836 [f]). Paraná: highway BR 153, General Carneiro (1) (MCP 1106 [m]); Coqueiro, Campina Grande do Sul (2) (MCP 1175 [m], MCP 1176 [m]); Corvo, municipality of Quatro Barras (1) (MHNCI 3193 [f]); Fazenda Tunas, Clevelândia (1) (MHNCI 5491 [m]); Mananciais da Serra, municipality of Piraquara (1) (MN 38757 [m]); Morro Anhangava, municipality of Quatro Barras (1) (MN 38751 [f]). Santa Catarina: Fazenda Naderer, São Bento (1) (MN 13400 [?]); Limoeiro, municipality of Água Doce (1) (MHNCI 3452 [m]). Rio Grande do Sul: Colinas de São Francisco, São Francisco de Paula (1) (MCP 1169 [m]); Farroupilha (2) (MCN/FZB 2093 [m], MCN/FZB 2112 [m]); Josafaz, São Francisco de Paula (1) (MCP 1076 [m]); Lajeadinho, São José dos Ausentes (1) (MCN/FZB 2082 [m]); Morro Pelado, Canela (1) (MCN/FZB 1413 [m]); Passo do Meio, Bom Jesus (1) (MCP 1083 [m]); Passo do Meio, São Francisco de Paula (1) (MCP 1213 [m]); Santo Antônio, São Francisco de Paula (3) (MCP 983 [m], MCP 984 [m], MCP 985 [m]); Serra da Boa União, Três Forquilhas/São Francisco de Paula (1) (MCP 1170 [m]); Serra do Umbu, Maquiné (2) (MCP 987 [f], MCP 988 [m]); locality? (MCN/FZB 2535 [?]).

Scytalopus iraiensis. Brazil. Paraná: propriety of R. Venske, right margin of rio Iraí (25°23'S, 49°05'W), municipality of Quatro Barras (3) (MN 43378 holotype [f], MN 43379 paratype [m], MN 43380 paratype [m]); two additional paratypes were examined before deposition at the Museu Paraense Emílio Goeldi, Belém, state of Pará (MPEG 52945 [m], MPEG 52944 [f]). Rio Grande do Sul: Banhado do Maçarico, Rio Grande (2) (MCP 957 [m], MCP 958 [m]).

Voice samples examined. Unless otherwise stated, tape-recordings listed here were obtained by the authors and are not yet deposited at sound archives. When recordings are associated with collected specimens the latter's label number is given in brackets. For each set of recordings general localities are followed by the names of municipalities. *Scytalopus speluncae* is divided into southern and northern populations according to Maurício (2005).

Scytalopus diamantinensis. Brazil. Bahia: Bonfim, within the Serra do Sincorá, municipality of Iramaia, song (n = 4, from one individual), alarm call (n = 6, from one individual), monosyllabic call (n = 7, from one individual) and bissyllabic call (n = 1); Campo Redondo, within the Serra do Sincorá, municipality of Ibicoara, song (n = 16, from two individuals [including MCP 1900]) and alarm call (n = 13, from three individuals); Capão do Vale, municipality of Ibicoara, song (n = 2, from one individual [MCP 1896]) and alarm call (n = 8, from two individuals [including MCP 1896]); near Ibicoara, within the Serra do Sincorá, municipality of Ibicoara, song (n = 1); Morros de Ouro, municipality of Barra da Estiva, song (n = 23, from at least four individuals), accelerating song (n = 3, from one individual), monosyllabic call (n = 13, from two individuals), bissyllabic call (n = 8, from one individual) and alarm call (n = 87, from at least four individuals); Rio Ribeirão, Chapada Diamantina National Park, municipality of Lençóis, song (n = 4, from one individual), monosyllabic call (n = 5, from one individual); Serra do Ribeirão, municipality of Lençóis, song (n = 11, from two individuals [MCP 1898, MZUSP 77827]), accelerating song (n = 1 [MCP 1897; female]); Sítio Santa Teresinha, at the base of Pico do Barbado, Catolés, municipality of Abaíra, song (n = 17, from three individuals), alarm call (n = 138, from two individuals) and accelerating song (n = 1).

Scytalopus novacapitalis. Brazil. Distrito Federal: Reserva Ecológica do Roncador, Brasília, song (n = 7, from five individuals; two recordings by J. Vielliard, five by G.N.M.), accelerating song (n = 3, from one or two individuals; J. Vielliard) and alarm call (n = 41, from two individuals; one recording by J. Vielliard, another one by G.N.M.); Ribeirão do Gama, near the village of Vargem Bonita, Brasília, song (n = 1 [MCP 1481]).

Scytalopus sp. nov. Brazil. Minas Gerais: Córrego Palmital headwaters, on the highway BR 367 (18°10'48"S, 43°33'08"W), municipality of Diamantina, song (n = 1); near the village of Palmital (22°11'S, 44°26'W and 22°12'S, 44°27'W), Serra do Palmital, municipality of Bocaina de Minas, song (n = 8, from two individuals [MCP 1509, MCP 1510]); Pico do Inficionado, Serra do Caraça, municipality of Catas Altas, song (n = 5, from three individuals [including MCP 1562]); Pico do Itambé (18°23'55"S, 43°20'52"W), Pico do Itambé State Park, municipality of Santo Antônio do Itambé, alarm call (n = 25, from one individual), multi-note call (n = 1); Pico Dois Irmãos (or Serra Grande; 18°12'26"S, 43°18'37"W), Rio Preto State Park, municipality of São Gonçalo do Rio Preto, song (n = 3, from one individual [uncatalogued specimen at the Departamento de Zoologia of the Universidade Federal de Minas Gerais – DZUFMG]), accelerating song (n = 3, from one individual [uncatalogued female at DZUFMG]) and alarm call (n = 29, from one individual [uncatalogued specimen at DZUFMG]); Serra da Piedade, municipality of Caeté, song (n = 2, from two individuals); Sítio Ponte Velha, right bank of Rio das Mortes, municipality of São João del Rei, monosyllabic (contact?) call (n = 3, from one individual; recording by V. Torga).

Scytalopus pachecoi. Brazil. Santa Catarina: edge of Bom Jardim da Serra town (28°20'S, 49°37'W), song (n = 6, from six individuals [including MCP 1188, MCP 1190]); Fazenda da Rocinha (28°18'S, 49°35'W), municipality of Bom Jardim da Serra, song (n = 5, from five individuals [including MCP 1183]) and accelerating song (n = 1); Serra do Rio do Rastro (28°23'S, 49°32'W), at the *Planalto* edge, on the Bom Jardim da Serra/Lauro Müller border, song (n = 2, from one individual [MCP 1189]); 7 km east of Bom Jardim da Serra town, song (n = 2, from two individuals). Rio Grande do Sul: Arroio Andrade headwaters (31°27'S, 52°28'W), Pelotas/Arroio do Padre municipalities, song (n = 1 [MCP 962]); Arroio Cadeia (31°35'S, 52°33'W), municipality of Morro Redondo, song (n = 1 [MCP 959]); upper Arroio Cadeia, Morro Redondo, song (n = 1); Arroio das Contas, São José dos Ausentes, song (n = 2, from two individuals [including MCP 1016]); Arroio do Ouro, Morro Redondo, song (n = 1); upper Arroio Moinho (31°19'S, 52°30'W), municipality of Canguçu, song (n = 1 [MCP 961]); Arroio Santa Bárbara, Pelotas, song (n = 2, from one individual) and contact call (n = 2, from two individuals); Arroio Santa Rosa, São José dos Ausentes, song (n = 2, from two individuals) and contact call (n = 4, from two individuals); Arroio São Gonçalo, Cambará do Sul, song (n = 3, from three individuals); northern edge of Cambará do Sul town (29°02'S, 50°08'W), song (n = 3, from three individuals [including MCP 1075]) and contact call (n = 2, from two individuals); first District (a municipality subdivision) of Canguçu, Canguçu, song (n = 2, from two individuals); Cerro das Almas (31°46'S, 52°35'W), municipality of Capão do Leão, song (n = 20, from at least 19 individuals [including MCP 1082, MCP 1179, MZUSP 77752]), accelerating song (n = 7, from six individuals), contact call (n = 116, from three individuals [including MCP 1082]) and alarm call (n = 20, from one individual); Colônia Cerrito Alegre, Arroio do Padre, song (n = 2, from two individuals); Colônia Solidez (31°18'S, 52°32'W), municipality of Canguçu, song (n = 1 [MZUSP 75764]); Harmonia (31°18'S, 52°25'W), municipality of São Lourenço do Sul, song (n = 1 [MCP 1009]) and accelerating song (n = 1); Monte Bonito, at highway BR 392 (31°39'S, 52°27'W), municipality of Pelotas, song (n = 1) and accelerating song (n = 1 [MCP 1022]); Morro da Antena (31°36'S, 52°31'W), municipality of Pelotas, song (n = 2, from one individual [MCP 960]) and contact call (n = 2, from two individuals); Ouro Verde, Cambará do Sul, song (n = 2, from two individuals); Paredão, Encruzilhada do Sul, song (n = 1); Parque Estadual do Turvo (27°14'S, 53°57'W), municipality of Derrubadas, song (n = 14, from at least 12 individuals) and alarm call (n = 43, from one individual); upper Rio Camisas, Cambará do Sul, alarm call (n = 1); upper Rio das Antas (28°47'S, 49°58'W), municipality of São José dos Ausentes, song (n = 8, from eight individuals [including MCP 1015, MCP 1040, MCP 1039]) and alarm call (n = 61, from two individuals); Santa Eulália, Morro Redondo, song (n = 1); Santo Amor (31°40'S, 52°35'W), municipality of Morro Redondo, song (n = 4, from four individuals [including MCP 977, MZUSP 77753]) and accelerating song (n = 1); Serra das Asperezas, Piratini, contact call (n = 26, from one individual) and alarm call (n = 29, from three individuals); Terra Indígena de Guarita, Erval Seco, song (n = 2, from two individuals). Argentina. Misiones: Parque Provincial islas Malvinas (now included in the Parque Provincial Arroyo Urugua-í), accelerating song (n = 1, from Straneck 1990); Ruta Provincial 20, at the Río Peperi-Guazu valley (near Brazilian border), San Pedro, song (n = 1).

Scytalopus speluncae (northern populations). Brazil. Minas Gerais: road to Marmelópolis, Delfim Moreira, song (n = 3, from three birds). Rio de Janeiro: Parque Nacional da Serra dos Órgãos, Teresópolis, alarm call (n = 3, from one individual) and bisyllabic call (n = 4, from one individual), L. P. Gonzaga (from Gonzaga and Castiglioni 2001). São Paulo: Pico dos Marins, Piquete, song (n = 1 [MCP 1177]); Serra do Bananal (Serra da Bocaina region), Bananal, song (n = 1) and alarm call (n = 8, from one individual; D. R. C. Buzzetti).

Scytalopus speluncae (southern populations). Brazil. São Paulo: Parque Estadual Intervales, alarm call (n = 4, from one individual), E. Endrigo. Paraná: highway BR 153, General Carneiro, song (n = 1 [MCP 1106]); Coqueiro, Campina Grande do Sul, song (n = 2, from two individuals [MCP 1176, MCP 1175]); Corvo, municipality of Quatro Barras, song (n

= 1). Santa Catarina: Campina da Alegria, Água Doce, song (n = 1); Fazenda da Rocinha, Bom Jardim da Serra, song (n = 1); Morro da Igreja, Urubici (within the Parque Nacional de São Joaquim), song (n = 1); Serra do Rio do Rastro, at the *Planalto* edge, on the Bom Jardim da Serra/Lauro Müller border, song (n = 2, from two birds). Rio Grande do Sul: Arroio São Gonçalo, Cambará do Sul, song (n = 5, from four individuals); Capão Alto, São Francisco de Paula, song (n = 2, from two individuals) and alarm call (n = 4, from one individual); Colinas de São Francisco, São Francisco de Paula, song (n = 4, from at least two individuals [including MCP 1169]); Hotel Veraneio Hampel, São Francisco de Paula, song (n = 2, from two individuals) and alarm call (n = 16, from one individual); Josafaz, São Francisco de Paula, song (n = 10, from 10 individuals [including MCP 1076, MCP 1170]), bisyllabic call (n = 45, from one individual) and alarm call (n = 21, from one individual); Matemático, Bom Jesus, song (n = 3, from three individuals); Monte Negro, São José dos Ausentes, song (n = 1); Passo do Meio, Bom Jesus, song (n = 3, from two individuals [including MCP 1083]) and bisyllabic call (n = 15, from one individual); Passo do Meio, São Francisco de Paula, song (n = 1 [MCP 1213]); right bank of Rio da Prata, Linha Flores, song (n = 2, from one individual); Santo Antônio, São Francisco de Paula, song (n = 4, from three individuals [MCP 983, MCP 984, MCP 985]); Serra do Umbu, Maquiné, song (n = 1 [MCP 988]) and alarm call (n = 18, from two individuals [including MCP 987]).

Scytalopus iraiensis. Brazil. Rio Grande do Sul: Banhado do Maçarico, Rio Grande, song (n = 6, from four individuals [including MCP 958]), and call (several samples from one individual); Banhado dos Pachecos, Viamão, song (n = 2, from two individuals).